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Contents

News of the Industry 157

Business in Brief 162

Calendar of Coming Events 165

First Half Totals Surpass Even the Most Optimistic Expectations. By Don Blanchard ... 166

What Is Engine Roughness? By P. M. Heldt .. 170

The Age Distribution of Automotive Workers .. 174

A New Positive Displacement Supercharger. By P. E. Biggar 178

Just Among Ourselves 180

Automotive Abstracts 181

Production Lines 183

New Developments 184

Advertisers' Index 48

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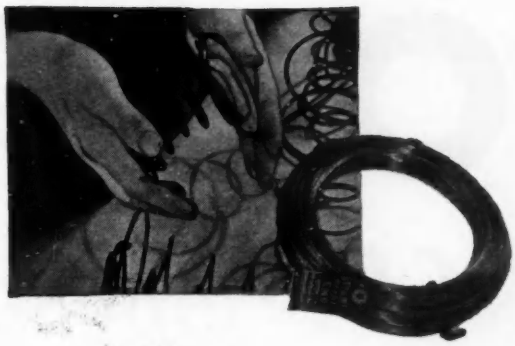

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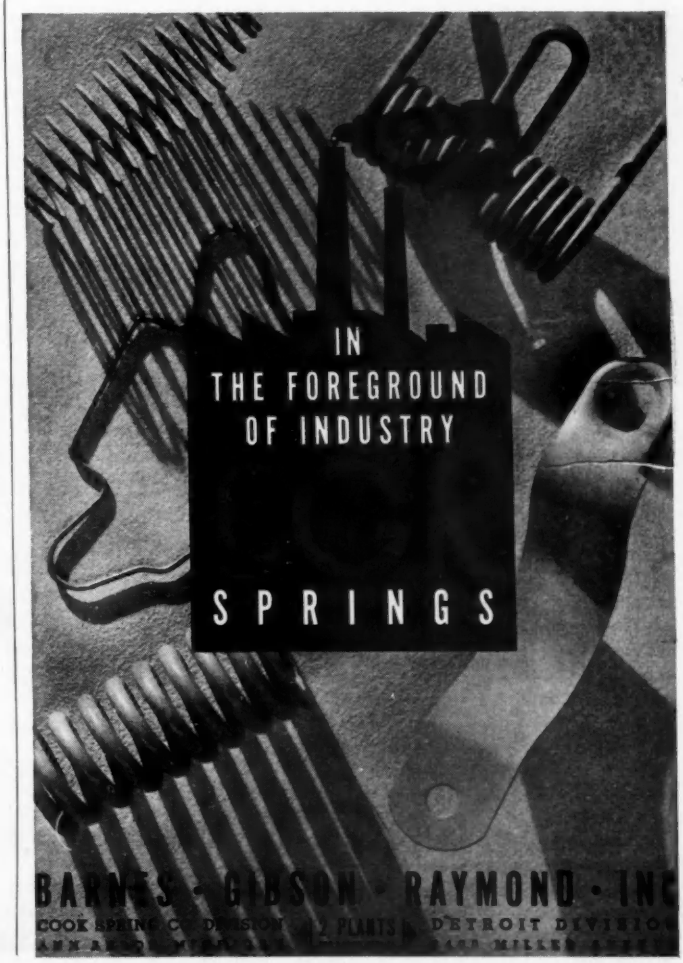

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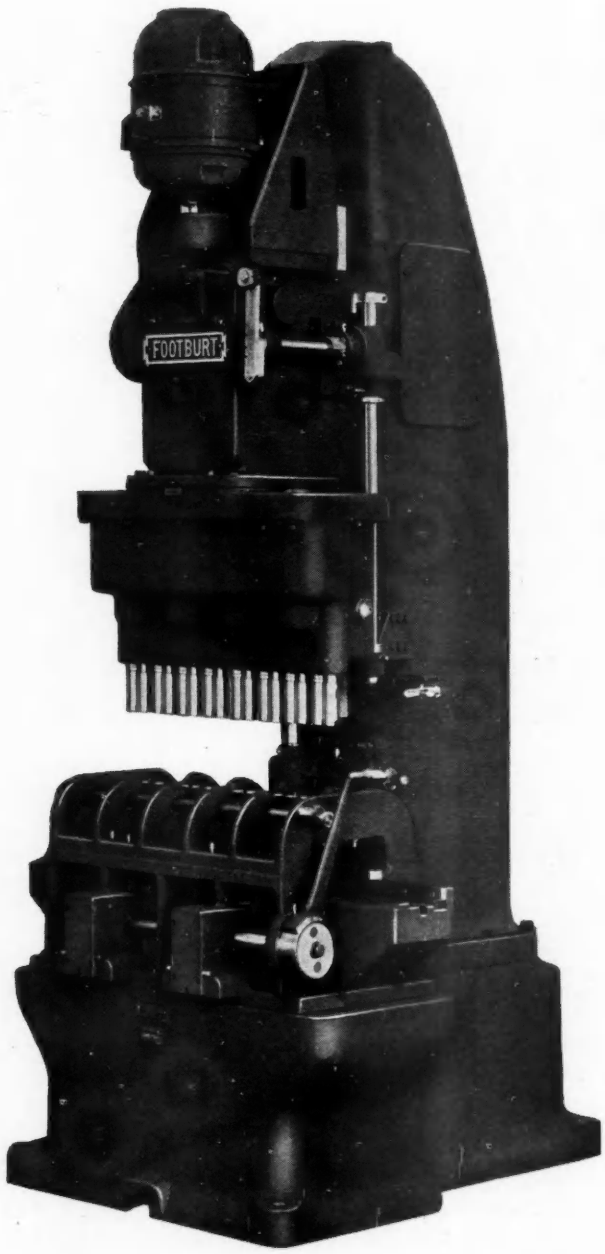

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AUTOMOTIVE INDUSTRIES

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Industry Favors Older Workers

AMA Research Shows Employees Over 45 Gained Faster Than Total Employment

NEW YORK, Aug. 10—Charges of discrimination against age in the automotive industry, made originally by organized labor and re-echoed in the Henderson report, are refuted by a factual study which Alvan Macauley, president of the Automobile Manufacturers Association, will make public tomorrow.

The report indicates no basis for the sensational charges that the pace of automotive production wears workers out at an early age and that the industry then throws them on the scrap pile. Not only does the report provide evidence that this practice does not exist, but it shows that industry treats its older workers more favorably than does industry generally.

In the great majority of industries, the report establishes that large expansion has resulted in reducing the proportion of older men, while stationary or declining employment in an industry has resulted in a systematic rise in the proportion of older employees. A very few industries moved counter to this general trend and among them was automobile manufacturing. Automotive employment of unskilled and semi-skilled men between 1920 and 1930 increased 39 per cent, but in the same period the industry's employment of men 45 or older rose 51.3 per cent. Relative to its rate of growth, the automobile industry is shown to have increased its proportion of older employees more than most other industries in this country between 1920 and 1930.

Data in the report for later years indicates that the older men have been given marked preference, both in continuity of employment and in volume of wages during the depression years. The comparisons do not cover skilled workers because census data for them are not available, but craftsmen obviously have far less to fear from the effect of age on their employability.

"As to the automobile industry," Mr. Macauley says, "these findings support our belief that the effect of mass production methods and the intensive mechanization which is necessary in order to obtain a better product at lower prices, do not displace older workers but rather places an added value upon their experience. Machines worth thousands of dollars, even though almost automatic, cannot be placed in charge of men with no knowledge of automobile work, and efficiency in all operations can come only with practice."

In case studies covering the operations of specific plants and groups of plants since 1930, the report gives the following developments:

1—A rapidly expanding company virtually doubled the number of men over 40 employed, but their proportion to the total employed declined slightly.

2—Five companies whose combined employment remained virtually unchanged, showed an increase of almost 20 per cent in number of employees over 40.

(Turn to page 185, please)

The complete report of the AMA on the Age Distribution of Automotive Workers begins on page 174 of this issue.

Millionth GM Car

General Motors has built its millionth 1935 motor vehicle in U. S. and Canadian factories 64 days ahead of the date upon which the millionth car or truck was turned out in 1934, William S. Knudsen, executive vice-president announced.

The millionth General Motor's automobile built since Jan. 1 this year was a Chevrolet Master de luxe town sedan that rolled off the assembly line at Flint at 10 a. m. Wednesday. The million mark was not reached last year until Oct. 10, more than two months later than this year. Wednesday's millionth car was number 1384 in Chevrolet's full day's production of 5600 units. The car's serial number was 1DA0839554, and motor number, 5,462,112.

Car Makers Tapering Off Rapidly but 200,000 1935 Models Are Still to Come

While automobile plants are rapidly tapering off and some already have finished with their 1935 run of cars, a fair-sized output is still to come off the assembly lines before "finis" can be written on the 1935 program. As nearly as can be estimated, there still are some 200,000 units of current models in "the works," not counting what already have been produced in August. Assuming most of last December's output was of this year's cars and trucks, upwards of 3,100,000 units of the 1935 model run will have been produced before all companies are launched on their 1936 program.

Three plants have resumed operations on 1936 models, three suspended operations this week, and four more are expected to wind up their 1935 runs before the end of the month. Several are not scheduled to go down until September and one important producer will continue operations on a substantial scale through next month. The Ford plants which have been closed for inventory and summer vacations during the past two weeks will resume operations next week.

Reflecting the summer closings, Detroit industrial employment at the end of July had dropped to the lowest point this year. The Board of Commerce index of 66.6 as of July 31 compared with 90.7 on July 15 and 83.0 on July 31 last year. Probabilities are that this will mark the low point for 1935 since the lay-offs occasioned by later plant closings will be offset by the resumption of operations at the big Ford plants. Should the July 31 index prove to be the low for this year, it will reflect considerable improvement

(Turn to page 185, please)

Fairness Urged in APEM Bulletin on Policies Under the Wagner Act

Parts makers going before the National Labor Relations Board to be created under the Wagner Labor Relations Act, are advised to be in a position to argue the fairness and fundamental justice of their position, rather than to limit themselves to a legal attack on the constitutionality of the statute, in an APEM bulletin, signed by John W. Blanchard, the association's counsel.

"Although an arbitrary course of opposition to the act," the bulletin says, "would not seem advisable, neither would a course of complete submission to it. Those employers who feel their constitutional rights are being infringed by this law should take a vigorous stand in protecting those rights. We feel, however, that they should proceed with caution and with a reasonable rather than an arbitrary position.

"We advise that before an employer oppose the act on constitutional grounds, he be sure of the absolute fairness and justice of his position. The members of our industry have, on the whole, always adopted a fair and reasonable attitude on labor problems. We feel that they should continue in this course with due regard to the reasonable rights of their employees and the public, as well as their own interests. Proceeding in this way they will probably have little conflict with the Wagner act."

The bulletin points out that opposing the act solely on constitutional grounds might bring public criticism on the employer involved and on industry in general since there exists a certain amount of public opinion favorable to the law. Moreover, there is always the possibility that the act will be held valid and, in any case, there will be a considerable delay before its constitutionality will be determined during which time a great deal of trouble may be caused those who oppose the new Board.

Discussing the constitutionality of the act, the bulletin says that it may be attacked on the following grounds:

1—It places invalid limitations on an employer's right to hire and contract with his employees.

2—It takes from minority employees the right to contract with employers without due process of law.

3—The authority given the Board to determine the proper unit of representation may be an unconstitutional delegation of power.

4—Certain procedural provisions may be invalid such as the provision that the Board's finding of facts is conclusive on the courts.

5—The authority granted the Board goes beyond the powers vested in Congress under the Commerce clause.

To avoid discrimination charges under the act, employers are advised in the bulletin that in hiring, firing, lay-offs, etc., all employees must be treated alike, regardless of their affiliations. Based on decisions of previous boards, the bulletin states that in cases of discharges, demotions, lay-offs, etc., there is no violation unless discrimination was the major cause. To prove discrimination, it must be shown that employers knew of the employee's union affiliation. Striking employees need not be rehired if they are guilty of violence. Concluding the discussion of this point, the bulletin states that a general policy against discrimination is a wise one which many parts makers have adopted.

The act requires employers to bargain with the majority representatives in a sincere effort to reach an agreement, but as a practical matter the bulletin suggests that proof of the right to represent the majority be required before recognition. Moreover, it is pointed out that mere membership in a union does not necessarily make union agents representatives of all the members. It must be shown that they were specifically chosen as bargaining representatives. On the other hand, union agents may represent nonmembers if the latter have selected such agents to represent them.

On the subject of elections, the bulletin explains that the Board has no power to promote elections, but can hold one only where there is a representation question affecting interstate commerce. The opinion is expressed further that there must be a real showing of facts that there is a question as to who the representatives are.

With respect to company unions, the bulletin says in part that in view of the purpose of the act, "We feel that there are many cases where an employer would not be in violation of the spirit and real purposes of the law by giving certain assistance to a labor organization, particularly if it were shown that the organization requested such support and it clearly appeared that there was no trace of domination or interference . . ."

Estimate July Sales Bigger Than in June

New passenger car sales in the United States during July were about 5000 more than in June, according to estimates made by R. L. Polk & Company on the basis of reports of registrations for 24 days of July in 112 of the larger cities, representing about 38 per cent of the United States market. No complete state registrations are as yet available. The July estimate of 285,000 compares with a June total of 280,360 units.

Caldwell Appointed

W. Bruce Caldwell has been named works manager of the Calumet Steel Company, recently acquired subsidiary of Borg-Warner Corporation of Chicago Heights, Ill., according to Roy C. Ingersoll, president.

GM Doubles Regular Dividend Rate and Declares an Extra of 25 Cents

With "an eye to the future and an ear to the ground," the directors of the General Motors Corp. this week evidenced their confidence in a continuation of favorable conditions in the automotive industry by upping the regular quarterly dividend from 25 to 50 cents per share, payable Sept. 12, 1935. In addition, the directors declared an extra dividend of 25 cents which in effect made the 50-cent rate retroactive to the second quarter.

The new regular dividend rate is equivalent to $2 per share annually which is two-thirds of the rate of the pre-depression period.

Under the new rate and including the 25 cents extra, 1935 dividends will be at the rate of $1.75 per share, as compared with $1.50 per share in 1934, and will total for the year approximately $75,000,000. Preferred dividends amounting to about $9,300,000 will raise disbursements to stockholders in 1935 to close to $85,000,000. These disbursements compare with net income after charges of $83,729,838 in the first six months of this year.

The following table compares the corporation's net income and common and preferred dividends back to 1929:

	Net Income (000 Omitted)	Dividends (000 Omitted)
1929	$245,970	$165,954
1930	153,766	139,973
1931	96,877	139,876
1932	165	63,199
1933	83,214	63,005
1934	94,769	73,622
1935	83,730*	85,000°

* Six months. ° Estimated.

In announcing the higher dividend rate, President Sloan said that "it has been a long standing policy of the board to establish a normal or regular rate of dividend as generous as possible, and one that can be reasonably counted upon by the stockholders, while at the same time reflecting the financial position of the corporation, the current rate of earnings, and the future trend, so far as that can ever be discerned. The increased rate ordered at this time reflects the judgment of the board with respect to all these factors.

"It must be recognized, however, that with things as they are, there may be injected into the situation, at any moment, unusual circumstances that can not be foreseen, such as may entirely alter the case. In such an event, the directors will not hesitate to re-appraise their position, and act accordingly."

Revamping of Extras On Steel Is Studied

Producers Take New View on Ford Order—Operating Rate Continues Up-Trend

On second thought the steel market sees the recent round tonnage purchases by Ford Motor Company at full prices in a slightly different light than it did at first.

Ford Motor Company is not only a steel consumer, but also a steel producer with a capacity that, when construction now under way is completed, will approximate 1,200,000 tons a year. Obviously, if the inquiries for prices put out by Ford had resulted in lowering the market for flat steels, the bulk of which enter into automotive consumption, Ford Motor Company would have profited much less from this than would other motor car manufacturers without steel plants of their own.

Automotive consumers on the whole are not finding any fault with the steel market's prevailing price structure, but would frown upon advances when the bulge in demand would make such a step seem logical to sellers.

Effective, Aug. 10, several steel bar mills have revised their list of extras, the $5 per ton premium formerly applying to forging quality bars being eliminated. A general revamping of extras applying to different descriptions of steel products seems to be slated for early announcement, not so much with a view to an upward price revision as to eliminate unevenness.

A further gain in activities is noted, 46 per cent of capacity being in operation, as compared with 44 per cent last week. Finishing mills are generally operating at a high rate. One of the leading interest's Pennsylvania subsidiaries has begun to finish sheets rolled in Gary and shipped from there. Detroit finishing mills are operating at close to capacity. Sheet mills in the Pittsburgh district are operating at between 55 and 60 per cent of capacity. Makers of full-finished automobile sheets are being pushed hard for speedier shipments.

Pig Iron—While buying continues largely along carload lines, automotive foundries are melting what iron they are taking in as fast as they receive it. Prices are entirely unchanged.

Aluminum—Routine conditions prevail in the market for primary as well as secondary aluminum. Prices are unchanged.

Copper—Consuming demand has tapered off, but the market shows steadiness, resale metal being held on a parity with that offered by producers who continue to quote 8 cents, delivered Connecticut point.

Tin—London and Singapore markets were closed on Monday, due to the annual Bank holiday, with the result that quotations in the New York market remained unchanged from the preceding week's close at 52.55 cents for prompt Straits tin. Another meeting of the International Tin Committee is scheduled for Friday of this week. The Tin Producers' Association has suggested that restrictions on output be continued for seven years.

R. H. Grant J. D. Mooney O. E. Hunt C. E. Wilson

The addition of these four vice-presidents and directors to the executive committee of General Motors brings the membership up to eleven. The other members are President Alfred P. Sloan, Jr., Chairman; Albert Bradley, Donaldson Brown, L. P. Fisher, W. S. Knudsen, John L. Pratt and John Thomas Smith. The last six are also vice-presidents and directors of the corporation.

Hunt for Personnel Held Reason for Delay in Naming Wagner Labor Board

Delay by the White House in setting up the Wagner-Connery Labor Relations Board is said to be due to the inability of the President to find the personnel he desires. It is reported that the President would like to name Lloyd K. Garrison as chairman of the board, but that Mr. Garrison, former head of the National Labor Relations Board, does not want the appointment, preferring to remain on the faculty of the University of Wisconsin, to which he returned upon resigning from the NIRB.

Doubt as to the constitutionality of the Wagner-Connery act is reported to be the reason for non-acceptances by prospective appointees of service on the board and it is of course known the act will be attacked in the courts.

Meanwhile the President has continued the NIRB until Sept. 1. Formerly a three-man board, it now has only one member, Edwin C. Smith. Though without power, it has been continued in order that machinery and a staff for the Wagner-Connery board will be available when the latter is set up. In line with his action in continuing the NIRB the President also has continued the Steel Labor Relation Board and the Textile Labor Board, attaching them to the Division of Mediation in the Department of Labor. It is the supposition that boards for major industries will be established under the Wagner-Connery board and that the Steel and Textile Boards will later be transferred in that capacity to the Wagner-Connery board. However, it is said that it is not contemplated to set up an automobile labor board. The old Automobile Labor Board, set up independently, and not under law as were the Steel and Textile Boards, was disbanded upon passage of the Wagner-Connery act, and it is said that it will not be re-established.

Organized labor is not raising any protest about delay in setting up the Wagner-Connery board. On the contrary, it is said to welcome the delay. This is attributed to the fact that the longer the delay the more time organized labor will have to use the act for purposes of unionizing industry before the act is tested in the courts.

ASI Show Space Nearly Sold Out

Complete sell-out of display space in the Automotive Service Industries Show, Atlantic City, N. J., Dec. 9-13, is forecast in the latest report from Show Manager Coffman's office in Chicago, which includes a list of 262 concerns whose applications for space were on file as of July 31. These reservations call for a total of 716 of the standard 10 x 10 ft. spaces, which leaves only 71 spaces available for reservation between now and show time.

Compared with those for the record-breaking show in Cleveland last year, that exhibition on the corresponding date had 239 concerns whose reservations called for 641 spaces.

Coffman further points out that this unusual interest in the show, being evidenced by manufacturers at this early date, is largely based on the certainty of a good jobber attendance, which is forecast in the reports of factory representatives upon whom manufacturer executives are largely dependent for advance information on jobbers' show plans.

"The remark that 'history repeats itself' is apparently going to be borne out in the 1935 A.S.I. Show," says Coffman. "Many will recall that in 1931 when the first of these jointly sponsored shows was held in Atlantic City, there was rather widespread doubt about the possibility of holding a successful show so far from the country's geographical center. Yet that show was the most successful up to that time and all indications are now that the entire situation is going to be repeated again this year and on a much larger scale."

Kishline Named Graham-Paige Chief Engineer

Succeeds Thoms — Voigt Advanced to Asst. Chief

Floyd F. Kishline has been named chief engineer of Graham-Paige Motors Corp. succeeding Louis Thoms, resigned, according to an announcement by E. R. Harrell, vice-president in charge of engineering. J. S. Voigt, chassis engineer, succeeds Mr. Kishline as assistant chief engineer.

Mr. Kishline, who was vice-president of the SAE passenger car activity in 1934, stands high in the estimation of automotive engineers. One of his recent achievements was the development and application of the centrifugal supercharger to the Graham eight, a high speed device which previously had not been made in production quantities.

Mr. Kishline, who has been prominently identified with automotive engineering developments since 1913, first joined Graham Brothers back in 1919 when he was appointed assistant engineer at the Evansville, Ind., plant. In 1921 he relinquished this post to take charge of engineering and sales for the Universal Products Co., and then rejoined Graham Brothers in truck manufacturing in 1926. Since that time he has been continuously associated with Graham automotive and engineering enterprises.

Mr. Voigt started with the Paige Motor Car Co. back in 1910 as draughtsman. During the World War he was with the Army Ordnance Department on tank development rejoining Paige as chief draughtsman after the armistice. In 1920 he went to Timken as assistant chief engineer and in 1924 came back to Paige as engineering field representative and then as chassis engineer.

Floyd F. Kishline (right), new Graham chief engineer, and his successor as asst. chief, J. S. Voigt

ALB Bargaining Agencies Move to Unite Automotive Labor Bodies in Federation

A movement for unification of the bargaining agencies set up in automobile plants by the Wolman Board got under way in Detroit last Saturday when members of the officers' association in one of their regular meetings, which had been thrown open to rank and file workers, voted to charter a non-profit organization under the laws of the State of Michigan. Approximately 150 persons attended the meeting. Normally from 50 to 75 attend the regular officers' association meetings.

A committee, on which each bargaining agency will be given one representative, was formed to draw up a constitution and by-laws. This committee meets Aug. 17, and on Aug. 24, a general meeting will be held to approve the constitution, authorize application for charter and elect officers.

The new organization will not be confined to the various bargaining boards but will be open to independent unions and any group of workers. It is to act as a coordinating body for its affiliates rather than as a close-knit union, and probably will be known as the "Brotherhood of Automobile Industrial Employees" or by some similar title.

Plans involve the joining of forces by the three leading independent unions. At least the Associated Automobile Workers of America, which polled some 6000 votes in the Automobile Labor Board elections, and the Automotive Industrial Workers Association, formed this year by over 13,000 Dodge plant workers, are supporting the coordination plan. Representatives of both unions spoke in favor of it at a meeting of automotive workers Sunday sponsored by the AAWA. The Mechanics Educational Society, which started as a tool and die makers organization, later admitting production workers, has been having internal troubles and has not been active.

Speakers at the Sunday rally stressed the need for cooperation, a program of education for workers and the coordination of activities of the independent unions.

The Associated Automotive Workers of America was formed just a year ago when workers in the Hudson Motor plant broke away from the A. F. of L. The Aug. 2 issue of the Detroit *Labor News*, a Federation weekly, stated that "Hudson Motor Car Employees Ask A. F. of L. to Take Them Back" and announced a mass meeting for Monday evening at which General Organizer F. J. Dillon would be principal speaker to "welcome the prodigal back to its father's house." Although it was announced that a public address system would be installed and a program of entertainment provided, a disappointingly small crowd assembled and the meeting was called off.

That Hudson workers were seeking reinstatement in the A. F. of L. was denied by Arthur Greer, president of the Hudson local, who said: "No organized group at Hudson and particularly none of the AAWA members have asked for reinstatement in the A. F. of L."

Matthew Smith, general secretary, said that the MESA had not been contacted regarding coordination plan and was not represented at any meetings where it was discussed. "We are willing, however," he said, "to talk to anybody about coordination of efforts as long as our own rights are upheld."

Speaking for the Federation, F. J. Dillon said: "The A. F. of L. will not permit itself to be diverted from its historic mission by the cry of dissenters, deserters or so-called messiahs. We are endeavoring and shall continue until our task is completed, the organization of automobile workers under the banner of the American Federation of Labor."

Describing the so-called unity conference as inspired by individuals whose chief claim to fame lies in the fact that they led their people out of the American trade-union movement, Mr. Dillon declared, "The automobile workers have more would-be spokesmen and is blessed with more self-appointed leaders, all with a contradictory philosophy but a definite road to the millenium, than any other group of workers in Detroit."

Hunsaker Joins United

Dr. Jerome C. Hunsaker, head of the Aeronautical and Mechanical Engineering Departments at the Massachusetts Institute of Technology, has become technical advisor to the United Aircraft Manufacturing Corporation.

G-P-F Adding Building

Geuder, Paeschke & Frey Co., Milwaukee, metal stampings, has started work on the construction of a factory extension, 80 x 116 ft., at 1532 West St. Paul Avenue.

Threat of Performance Laws Revives Interest in Truck Rating Formula

Due to outside influences, particularly those arising from the present legislative trend toward motor truck performance requirements, the matter of adopting a uniform standard motor truck rating formula has been revived by the SAE.

In several states bills have been introduced, regulations prescribed and consideration given to the subject with the object of requiring certain minimum performance characteristics such as ability to maintain certain rates of speeds on grades of certain steepness. The National Conference on Street and Highway Safety is already on record as favoring a requirement of ability to make 20 miles per hour on 3 per cent grades in level country and 6 per cent in hilly districts. The State of Rhode Island for a time attempted to enforce a requirement of 20 miles per hour on 4 per cent grades and it seems certain that minimum performance ability will be agitated very actively in the future.

Judging by past performances, it was felt that unless a rational formula were available, legislatures might take hasty action and adopt regulations that might easily become burdensome and unreasonable both to truck producers and users. Accordingly at the S.A.E. Summer Meeting L. D. Buckendale of Timken, chairman of the S.A.E. Motorcoach and Motor Truck Rating Committee, held a conference of his group and revived discussion of the motor truck rating formula which was submitted to the industry about two years ago.

This group decided to submit that portion of the old report which dealt with the performance factor to the membership of the Rating Committee, to the transportation engineer of truck manufacturers and to representative operating engineers in user companies for the purpose of review, checking and comment.

Accordingly the basic formula given below has been submitted to a large group of interested persons who have been requested to examine it and check its results with whatever formulas have been used by them. It is the committee's thought that while the constant "3.34" of the formula is the result of about two years' study and represents a consensus of opinion and practice, this further investigation may indicate the need for some modification or even the addition of another factor to take into account the effect of differences in governed engine R.P.M.

We understand that the present formula is being used by certain manufacturers and fleet operators at the present time, although it has not had the outspoken endorsement of the leading organizations in the transportation field. Here is a good opportunity for those now using the formula as well as other interested people in the transportation field to consider the matter of truck rating officially and aid in the establishment of a uniform code. Concerted action along this line may forestall unwise or precipitate action on the part of the various State Legislatures.

The following formula is submitted by the S.A.E. Motorcoach and Motor Truck Rating Committee as the result of its meeting at White Sulphur Springs, W. Va., June 18, 1935, only for review and comment and is not a definite report of the committee. *The basic formula follows:*

$$\text{Performance Factor} = \frac{3.34 \times \text{Piston Displ.} \times \text{R.P.M.}}{\text{Gross Veh. Wgt.}}$$

The permutations of which are:

$$\text{Miles per Hr.} = \frac{\text{Performance Factor}}{\text{Grade in \%} + 1.5}$$

$$\text{Grade in \%} = \frac{\text{Performance Factor}}{\text{M.P.H. at Gov. Speed}} - 1.5$$

$$\text{Gross Veh. Wgt.} = \frac{3.34 \times \text{Piston Displ.} \times \text{R.P.M.}}{\text{Performance Factor}}$$

$$\text{Piston Displ.} = \frac{\text{Performance Factor} \times \text{Gr. V. Wgt.}}{3.34 \times \text{R.P.M.}}$$

Auto-Lite Acquires Bumper and Die Casting Factories

The Electric Auto-Lite Co., now making many products in addition to its original line of starting, lighting and ignition equipment for motor cars, has entered two more fields with the acquisition, announced by Royce G. Martin, president, of the Central Brass & Fixture Co., Springfield, Ohio, where bumpers will be made, and the Alemite Die-Casting & Manufacturing Co., with plants in Chicago and Woodstock, Ill.

Both plants will be managed directly from the Toledo headquarters. Large Chrysler contracts and some orders from other independent manufacturers have been booked, it was stated.

It was announced that the Springfield plant, which has been idle for three years, will be revamped and modernized to produce 4000 bumpers daily, plus other accessories such as guards, by Oct. 1. About $150,000 will be expended in the plant rehabilitation. Citizens of Springfield raised a fund of $20,000 to aid in getting the plant opened. At least 300 will be employed.

The Alemite Die-Casting & Manufacturing Co. employs normally about 600 workmen and has lately been doing about $100,000 monthly volume of business. It was originally organized in 1911.

Consideration in the transactions were not announced but it is believed that exchange of stock was the basis for acquisition.

Gabriel in Production on New Shock Absorber

A new type of hydraulic shock absorber, to be known as the Gabriel-Walex, is now being placed in production by the Gabriel Company of Cleveland, Ohio. It was originated two years ago at the Gabriel factory in Berlin, in collaboration with the engineering department of the Cleveland factory, and it is stated that many European cars are already equipped with it. The Gabriel Company plans to put out a complete line for application to private passenger cars, buses, trucks and motorcycles.

A feature of the new device is an outside adjustment which is said to give a wide range of control on both the one-way and two-way types. The action of the shock absorber is said to be independent of weather conditions and the device itself proof against oil leakage. Service is required once a year, and may be had either at Gabriel distributors or at car dealers.

Timken Roller Bearing Declares 50 Cent Extra

Following the 25-cent extra paid in June, Timken Roller Bearing Co. has declared another extra, this time of 50 cents, payable to stockholders of record on Aug. 20.

In the first half of 1935, the company earned $4,522,278 after all charges, equal to $1.87 per share. These earnings are before an estimated profit of $250,000 on the sale of foreign securities. Last year in the first half the company earned $2,576,293, equal to $1.07 per share.

Second quarter earnings were $2,160,341, against $1,298,094 in the corresponding period last year, and $2,361,937 in the first quarter.

They're stripped for action on the water deck in the new Dodge truck plant. These athletic looking chaps apply the elbow grease on one of the few operations that still have to be done by hand.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

Improvement in general business activity continued last week, with further gains in wholesale and retail trade. Increased sales resulting from the abnormally hot weather have reduced stocks of summer goods to a very low level. The heavy industries held up well, and steel operations increased for the fourth successive week; production is now at the rate of 44 per cent of capacity, which marks an increase of almost two points for the week.

Carloadings Up Again

Railway freight loadings for the week ended July 27, amounted to 593,366 cars, which marks an increase of 3096 cars above those during the preceding week, a decline of 13,580 cars below those a year ago, and a decline of 48,377 cars below those two years ago.

Power Output Expands

Production of electricity by the electric light and power industry in the United States during the week ended July 27 was 8.3 per cent above that in the corresponding period last year. Production during the preceding week was 8.6 per cent above that a year ago.

Exports Exceed Imports

During June, exports exceeded imports for the first time in three months. Despite the usual seasonal decline in exports during June, the total was 3 per cent higher than that for May, while imports, which usually decrease in that month, were 8 per cent lower. During the first six months of this year there was a moderate decline in both the value and volume of exports, as compared with those in the corresponding period last year, while imports increased approximately 15 per cent in both volume and value.

Lumber Near High

With one exception, lumber production during the week ended July 20 was the highest for any week this year. Shipments and orders continued their upward trend and were the highest since May.

$487 Million for Farmers

Cash income of farmers from the sale of crops and government payments during June amounted to $487,000,000, as against $519,000,000 in May and $451,000,000 in the corresponding period last year.

Prices Rise

Professor Fisher's index of wholesale commodity prices for the week ended August 4 stood at 82.9, as against 82.6 the week before and 81.7 two weeks before.

Federal Reserve

The consolidated statement of the Federal Reserve banks for the week ended July 31 showed increases of $1,000,000 each in holdings of discounted bills and bills bought in the open market. Holdings of government securities remained unchanged. Money in circulation increased $23,000,000, and monetary gold stocks increased $8,000,000.

Germany Grants Subsidies to Encourage Native Fuels

Determined efforts are being made in Germany to influence operators of bus and truck services and owners of marine and stationary gasoline engines to convert their engines so that they can be operated on native fuels, according to a report from assistant trade commissioner Rolland Welch of Berlin. The object, of course, is to eliminate the need for imported gasoline. The Berlin Transport Company, operating the extensive, bus, street car and subway systems of the metropolis, has been using coal gas on the buses of one line and reports its experiments as entirely satisfactory. During the summer it intends to operate a bus using wood gas, while the city of Berlin plans to put into service a truck operated with coal gas, a garbage wagon using coal gas, a truck using wood gas, another using charcoal gas, and two trucks operated on other German gases. Other lines are also experimenting on trucks and buses using various gases. The Prussian State Government and the Bavarian State Forestry Service are trying to promote the use of wood and charcoal gas by subsidizing purchases of necessary equipment. The former will pay 600 marks (about $240) for the purchase and installation of the necessary equipment to use wood or charcoal gas with a new vehicle or stationary engine, and 300 marks for anyone who will purchase such equipment for installation in old vehicles or stationary engines which have been operated on gasoline heretofore.

Recently there was a parade of 60 motor vehicles in Berlin, each one of them operating on some fuel other than gasoline or Diesel oil. These vehicles operated on wood gas, charcoal gas, lighting gas, methane gas, natural gas, coal and coke gas, peat gas, electricity and steam. An official announced after the parade that there were 300,000 buses and trucks in Germany which could be operated successfully on these fuels, and that hereafter no vehicle would be placed into service by the city of Berlin, until it had been turned over to the testing department and proving grounds to see whether or not it could be operated on some German material. There is every indication that Government officials feel that the experimental period has passed and that a serious effort will be made to extend the use of German fuels to a very important degree.

Federal Issues 25th Birthday Brochure

To commemorate a quarter of a century of operation, the Federal Motor Truck Co. has issued a handsome brochure entitled "Twenty-Five Years of Federal Trucks."

The story of the company is told briefly, starting with the first truck produced which Martin L. Pulcher, now president but then vice-president and general manager, delivered personally to a buyer in Lynn, Mass. Illustrations of subsequent Federal models up to the present add interest to the presentation.

Other features deal with Federal personnel, dealer organization, foreign users and the manufacture of the vehicles.

NSPA Elects Four Jobbers, 2 Manufacturers to Assn.

At a series of mid-summer committee and board meetings held by National Standard Parts Association, in Detroit, during the week of July 7, the Association elected six additional concerns to membership. Included were four jobbers and two manufacturers, as follows:

Jobbers: LeBeck Sales Co., Atlantic City, N. J.; Miami Parts & Spring Co., Inc., Fla.; Ant. Bernier, Quebec City, P. Q.; Service Motor Supplies Pty. Ltd., Johannesburg, So. Africa.

Manufacturers: Kant-Rust Corporation, Rahway, N. J.; Vulcan Products Corporation, Mankato, Minnesota.

35 Full Moons to Shine on New Frisco Bridge

The largest and most spectacular installation of sodium lighting in the world will provide more than eight million lumens for the San Francisco-Oakland Bay bridge upon its completion, according to General Electric engineers, designers of the sodium-light equipment. More than 35 full moons would be required to give the same average intensity on the upper roadways of the double-deck spans as will be provided by this amount of sodium light.

Cochrane Joins Casco

Bert G. Cochrane has been named vice-president and sales manager of Casco Products to fill the vacancy caused by the death of Carl E. Vaughn. Mr. Vaughn died June 26. For many years Mr. Cochrane was president of the Bert G. Cochrane Co. of Chicago, manufacturers agent and distributor of automotive products.

Will Survey Bank-Finance Company Relationships

Milan V. Ayres, secretary and analyst of NASFC, Chicago, reports that a number of months ago the association was informed by Alexander Wall, secretary of Robert Morris Associates, that his organization had in mind making a special study of finance company paper as a bank investment, with particular reference to finance company practices which affect the goodness of such paper. Several conferences were since held with Mr. Wall and Edward M. Tourtelot, president of Robert Morris Associates, who is also vice-president of the First National Bank of Chicago. Robert Morris Associates is a national association of the credit officers of banks.

These conferences have resulted in the appointment of two committees; one by Robert Morris Associates, and one by NASFC, which are to cooperate in a study of bank and finance company relationships. They will have as their first objective the drafting of a form of standard financial statement for finance companies. Following are the members of the committees:

Glenn B. Ryman, president, American Discount Company, Atlanta, Ga., chairman; Robert P. Babcock, president, Seaboard Commercial Corporation, New York City; H. K. Corbin, president, Motor Finance Corporation, Newark, N. J.; T. E. Courtney, president, Northern Illinois Finance Corporation, DeKalb, Ill.; C. F. Cunningham, president, National Discount Corporation, South Bend, Ind.; Donald L. Davis, president, Lycoming Finance Company, Williamsport, Pa.; William W. McCarthy, vice-president, Devonshire Financial Service Corporation, Boston, Mass.; and C. H. Schreiber, vice-president, Securities Investment Company of St. Louis, St. Louis, Mo.

Robert Morris Associates will hold their annual convention early in October, probably at French Lick, when they propose to devote one of their sessions to a discussion of bank-finance company relations and the standardization of the finance company financial statement.

Hupp Reports 6 Mos. Loss

Including a loss of $963,501 on the sale of a part of its unused Cleveland plant, Hupp Motor Car Corp., for the six months ended June 30, reports a deficit of $2,090,456, compared with a net loss of $1,479,367 in the corresponding period last year. Net sales in the period were $4,444,481 against $3,358,702.

The June 30 balance sheet shows current assets totaling $2,000,288 and consisting of cash, $174,620; Government bonds, $5,820; receivables, $635,243, and inventories of $1,184,604. Current liabilities totaled $600,541 made up of payable, $247,987; accrued taxes, wages, etc., $167,718; and reserves of $184,836. Net working capital was $1,399,747 against $2,462,925 a year earlier.

NADA Closes Capital Office

The National Automobile Dealers Association is closing its Washington office. After a vacation, J. Reed Lane of the association staff, who has been stationed in Washington, will make his headquarters in St. Louis.

21.8% of Dealers Sold Five or Less Cars in '34

Five or less new cars were sold in 1934 by 21.8 per cent of the nation's dealers, the National Automobile Dealers Association estimates on the basis of information from 16 states and the District of Columbia. The association's complete estimate of the volume classification of dealers follows:

1 to 5 new cars	7824
6 to 15 " "	7210
16 to 25 " "	4864
26 to 50 " "	5627
51 to 75 " "	4026
76 to 100 " "	2493
101 to 150 " "	1882
151 to 200 " "	867
201 to 300 " "	543
301 to 400 " "	313
401 to 500 " "	130
501 and up " "	198
Total	35.977

On a percentage basis, this table indicates that 41.8 per cent sold 15 or less cars last year and that 55.3 per cent sold 25 or less units. The median dealer therefore sold less than 25 cars with the indications that he probably delivered between 20 and 25. The average dealer last year sold 52 cars (number of cars sold divided by number of dealers). Furthermore, assuming that 19,898 dealers who are estimated to have sold 25 or less cars, actually averaged 20 cars per dealer, their aggregate volume was 397,960. This figure is 21 per cent of total volume, whereas the group includes 55.3 per cent of the dealers.

Export Value Up 16% in First Half

Exports and Imports for the Automotive Industry for June and Six Months Ended June 1935-34

	June				Six Months Ended June			
	1935		1934		1935		1934	
	Number	Value	Number	Value	Number	Value	Number	Value
Automobiles, Parts and Accessories	....	$20,070,235	....	$19,996,513	....	$123,447,273	....	$106,727,302
Motor trucks, buses and chassis (total)	9,753	4,813,765	6,816	3,596,742	46,313	23,929,632	49,872	23,182,549
Under one ton	862	279,639	587	214,226	3,961	1,321,871	4,891	1,545,825
One and up to 1½ tons	7,348	3,380,672	5,164	2,273,822	34,440	15,388,191	38,638	15,788,278
Over 1½ tons to 2½ tons	1,101	830,456	868	722,615	6,468	4,990,698	5,151	4,082,489
Over 2½ tons	185	262,051	157	350,374	1,126	1,963,858	996	1,647,429
PASSENGER CARS								
Passenger cars and chassis	16,517	8,936,902	17,970	9,939,682	95,548	53,382,222	79,235	43,450,751
Low price range $850 inclusive	15,368	7,793,408	16,575	8,418,727	88,516	45,719,226	73,021	36,470,224
Medium price range over $850 to $1,200	893	831,084	1,014	996,143	5,217	4,960,080	4,032	3,901,109
$1,200 to $2,000	105	153,671	229	344,017	778	1,191,289	1,210	1,880,646
Over $2,000	48	115,792	54	141,786	488	1,290,357	370	972,306
PARTS, ETC.								
Parts except engines and tires	....	.....	....	.....	....	.....	....	.....
Automobile unit assemblies	....	3,409,551	....	3,502,983	....	27,814,398	....	23,905,960
Automobile parts for replacement (n.e.s.)	....	2,126,143	....	2,018,310	....	12,690,653	....	10,921,929
Automobile accessories (n.e.s.)	....	201,767	....	199,818	....	1,513,075	....	1,366,363
Automobile service appliances	....	273,860	....	277,867	....	2,005,090	....	1,190,993
Airplanes, seaplanes and other aircraft	15	214,016	23	466,785	182	4,476,969	146	2,498,813
Parts of airplanes, except engines and tires	....	513,018	....	192,625	....	2,438,337	....	1,378,725
INTERNAL COMBUSTION ENGINES								
Stationary & Portable:								
Diesel and semi-Diesel	24	87,620	5	6,668	147	399,655	53	116,014
Other stationary and portable	....	.....	....	.....	....	.....	....	.....
Not over 10 hp.	1,225	50,960	1,042	47,458	4,856	271,842	2,844	173,891
Over 10 hp	151	68,879	82	61,287	676	389,290	531	347,627
Automobile engines for:								
Motor trucks and buses	447	45,095	439	48,803	2,210	332,272	2,725	330,765
Passenger cars	1,845	119,956	2,016	117,211	17,424	1,108,424	17,368	1,061,718
Aircraft	42	173,340	44	229,739	252	906,899	456	2,083,642
Accessories and parts (carburetors)	....	162,252	....	150,572	....	849,372	....	681,167
IMPORTS								
Automobile and chassis (dutiable)	56	21,334	29	11,306	259	132,968	223	78,429

The first model of a two-place enclosed monoplane which was tested at Los Angeles Municipal Airport recently, by Vance Breese. The plane will sell for approximately $1,500, according to its designer and builder, Neill McGaffey. It is powered with a Ford V-8 motor

Parts Shipments Lower as New Models Near

Seasonal declines in the aftermarket divisions and tapering off of original-equipment shipments to car factories in anticipation of new model announcements in November this year combined to bring the June MEMA index figures below those for May.

The composite index of all shipments went down to 119 as compared with 132 for May, but stood well ahead of June a year ago which registered 106. Original equipment shipments to car and truck factories tapered off to 102 from 132 for May to compare with 101 for June, 1934. Service parts shipments to wholesalers went down to 131 as compared with 148 for May and 135 for June, 1934. Accessories shipments to wholesalers dropped to 103 for June as compared with 132 for May and 96 for June a year ago. Service equipment shipments to wholesalers dropped off only one point to 82 for June as compared with 83 for May and 71 for June, 1934.

AMA Sponsors Harvard Book on Highway Control

Publication of a four-hundred-page book which will serve as a standard textbook on all phases of highway control has been undertaken by the Harvard Bureau for Street Traffic Research, Dr. Miller McClintock, Bureau Director, announces. This is one of the projects made possible by grants which the Bureau has received from the Automobile Manufacturers Association.

The book, "Traffic Control" will be issued as the successor to "Street Traffic Control" a book published in 1925, also by Dr. McClintock, which is still the standard text on this subject.

Motor Carrier Bill Awaits Roosevelt OK

President Roosevelt on Monday of this week received the bill providing for the regulation of interstate motor carriers, which has been approved by both branches of Congress. Up to press time, he had not signed it but there is no doubt that it will receive his O. K.

While it has given out nothing regarding its plans, it is understood that the Interstate Commerce Commission has virtually completed preparations for setting up machinery to administer the motor carrier act. The American Trucking Association has sent out notices to its members advising them of procedure to be followed under the new law which becomes effective Oct. 1.

Union Gets Contract

A new record in peaceful labor negotiations was set in Cleveland by the Art Rattan Co., manufacturers of automobile seat cushions and coverings, and its 150 employees.

Employees formed a Federal union and 16 days after it was organized a contract with the company was signed providing wage increases and recognizing the 40-hour week of NRA days. Not an hour's time was lost by the company or any worker. There was no interruption of production.

Oldfield on Safety Tour

In connection with the national campaign for safer driving being sponsored by Plymouth, Barney Oldfield will make a tour of the company's dealers and distributors. In the veteran race driver's opinion, a mile a minute is fast enough for anyone on present highways, adding that some day superhighways may be available on which 80 m.p.h. will be safe.

Output Will Pass 1934 Total Late This Month

July Production Over 340,000—AMA Members Build 256,000 Vehicles

Final July production figures will show a total verging on 350,000 cars and trucks for the United States and Canada, the monthly estimate of the automobile manufacturers indicates.

Members of the AMA in July produced 256,200 units. Ford output during the month increased the total for the industry to above the 350,000 mark. This compares with 377,065 in June and 276,047 last year. On the basis of this July estimate, output in the first seven months approximated 2,720,000 as compared with 2,072,500 in the corresponding 1934 period and 2,869,963 in all of last year. The industry, therefore, is due to pass the 1934 full year total toward the latter part of this month.

AMA members produced 32 per cent more in July than in the same month last year when their output aggregated 194,727 and only 7 per cent less than their June, 1935, production of 274,093. The seven-month AMA total is 1,791,981 against 1,475,336 in the similar period last year.

"The Time Machine"

The operation and benefits of instalment financing are explained in simple terms in a folder entitled "The Time Machine" which the National Association of Sales Finance Companies has just issued as a part of its public relations program.

Motors Up to 18.8%

The market value of seven "motor" common stocks increased 18.8 per cent in July, as compared with an 8.4 per cent increase for 100 representative stocks included in a survey made by Frazier, Jelke & Co.

First Half Earnings

	First Six Months 1935	1934
12 Vehicle Makers previously reported	$104,511,268	$73,188,391
Hupp Motor Car Corp.	— 2,090,456	— 1,479,367
Mack Trucks, Inc.	— 319,033	180,980
Total	$102,101,779	$71,890,004
23 Parts Makers previously reported	$ 20,366,572	$12,116,469
Briggs & Stratton Corp.	677,344	249,768
Clark Equipment Co.	27,066	216,532
Marlin Rockwell Corp.	382,015	227,264
Spicer Mfg. Co.	249,449	297,216
Timken Roller Bearing Co.	4,522,278	2,576,293
Total	$ 26,224,724	$15,683,542
Grand Total	$128,326,503	$87,573,546

Business Attacks "Share-the-Wealth" Bill at Senate Committee Hearings

With business attacking the House "share-the-wealth" bill as discouraging to recovery and unsound in principle and the administration pressing for something like the original scale of graduated levies on corporate income and a tax on dividends received, developments at the Senate Finance Committee hearings this week indicated the possibility that the bill might be considerably modified before it is reported, although in what direction seems to be anybody's guess.

The proposed excess profits taxes and the steep taxes on large inheritances were characterized by representatives of the U. S. Chamber of Commerce as highly discouraging. Attacking the graduated corporate income tax, one Chamber spokesman said: "Should the bill pass Congress there would be embedded in the law the principle and precedent of a graduated corporation income tax without relation to capital invested and based only on size. We must oppose any proposal that would establish this precedent as it is wrong in principle." Senator Gore also attacked this principle.

Appearing as a Chamber witness, Prof. Fred R. Fairchild of Yale said: "It is clear that the determining factors in producing revenues are not high rates—certainly not extremely high rates—but the amount of taxable incomes and the volume of taxable business activities. The present tax system of the United States would quickly produce very much greater revenues should normal business activity be restored . . . the most important consideration in connection with Federal taxes is to seek to preserve and encourage business activity. . . ."

Robert H. Jackson of the Treasury Department presented figures showing that the percentage of Federal revenue derived from excise, processing and other similar taxes had increased sharply in recent years while the percentage from income taxes had contracted greatly. He interpreted these figures to mean that the principle of ability to pay was not being followed. He indicated that the excise and processing taxes bore no close relation to ability to pay but were levied on all alike. Apparently he did not consider that size of income was a material factor in the amount of taxed goods consumed. Nor apparently did the fact weigh greatly with him that income taxes have declined sharply because incomes themselves have shrunk and many who had taxable incomes in 1929, no longer have them; in other words ability to pay has contracted.

Mr. Jackson's case for the graduated levy on corporate income, although apparently based mainly on the administration's emotional antipathy to bigness, also seemed to be founded on the circumstance that the incomes of the bigger companies have held up better during depression and hence at present offer a more fertile field for the tax collector to get revenues. Criticizing the excess profits taxes proposed by the House, which he said was not a substitute for the graduated levy on corporate income proposed by the President, Mr. Jackson asserted: "The unusual high rates of profit for small concerns are often only necessary compensation for the risk that they face and for their frequent losses. If small concerns were not able to enjoy good years they could not withstand the competition of their larger and more stable competitors during poor years. We do not wish to discourage the growth of small concerns that gives our economy the elasticity and flexibility in production and prices that are so valuable."

On the subject of concentration, Mr. Jackson said that 53 per cent of all corporate assets were owned by 618 corporations representing only 0.2 per cent of the number of companies. Under the proposed graduated income tax, he said that 5 per cent of the corporation controlling 85 per cent of the assets, would pay higher taxes. In the manufacturing classification 0.8 per cent of the companies control 64.4 per cent of the assets. Mr. Jackson also advocated a tax on dividends received by corporations.

Lauson Names Officials

Henry S. Wright, president of the Lauson Co., New Holstein, Wis., reorganization of the John Lauson Mfg. Co., maker of gas and kerosene engines, tractors, etc., has announced the appointment of William M. James of Milwaukee as factory manager, and H. C. Rawlings, also of Milwaukee, as production manager. Alfred Bosma continues as chief engineer and O. R. Mueller as director of the experimental and research department.

Thompson Piston Pin Strike Deadlocked

Strike of 150 employees at the pin plant of the Thompson Products Co., Cleveland, one of the largest parts manufacturers in northern Ohio, was stalemated this week after an agreement between metal trades unions and the company was not accepted after several lengthy negotiations. The negotiations were conducted by A. L. Faulkner, U. S. Labor Counciliator at Cleveland.

The strike so far has not affected the 800 employees at the main Thompson plant nor the 150 workers at the piston plant.

The strike began when two members of an employees negotiating committee were discharged. Company officials said they were not discriminated against but were laid off with others in a general cutting down of employees.

Ask More for Surveys

The Automotive Division of the Department of Commerce has increased the amount of the work relief allotment it has requested for the purpose of making automotive surveys, from $700,000 to $1,026,000.

Knudsen Sees Bigger Car Markets in 1936 Despite Presidential Campaign

"Business generally is better," said W. S. Knudsen, executive vice-president of General Motors Corp., in a press interview which followed his announcement that General Motors had completed its millionth 1935 motor vehicle on Wednesday this week. "The general picture is improving right along," he said. "We note more and more optimism in those with whom we come in contact in our business."

"Can these salutary conditions be credited to the New Deal?" he was asked. "No," Mr. Knudsen replied, "I lay it to the Lord. He is not worried about 1936 being a Presidential campaign year. To be pessimistic about next year, one has to feel that incomes will come down. As long as they are going up, business is bound to be better and the motor industry will be one of the first to share in the increasing purchasing power of the people."

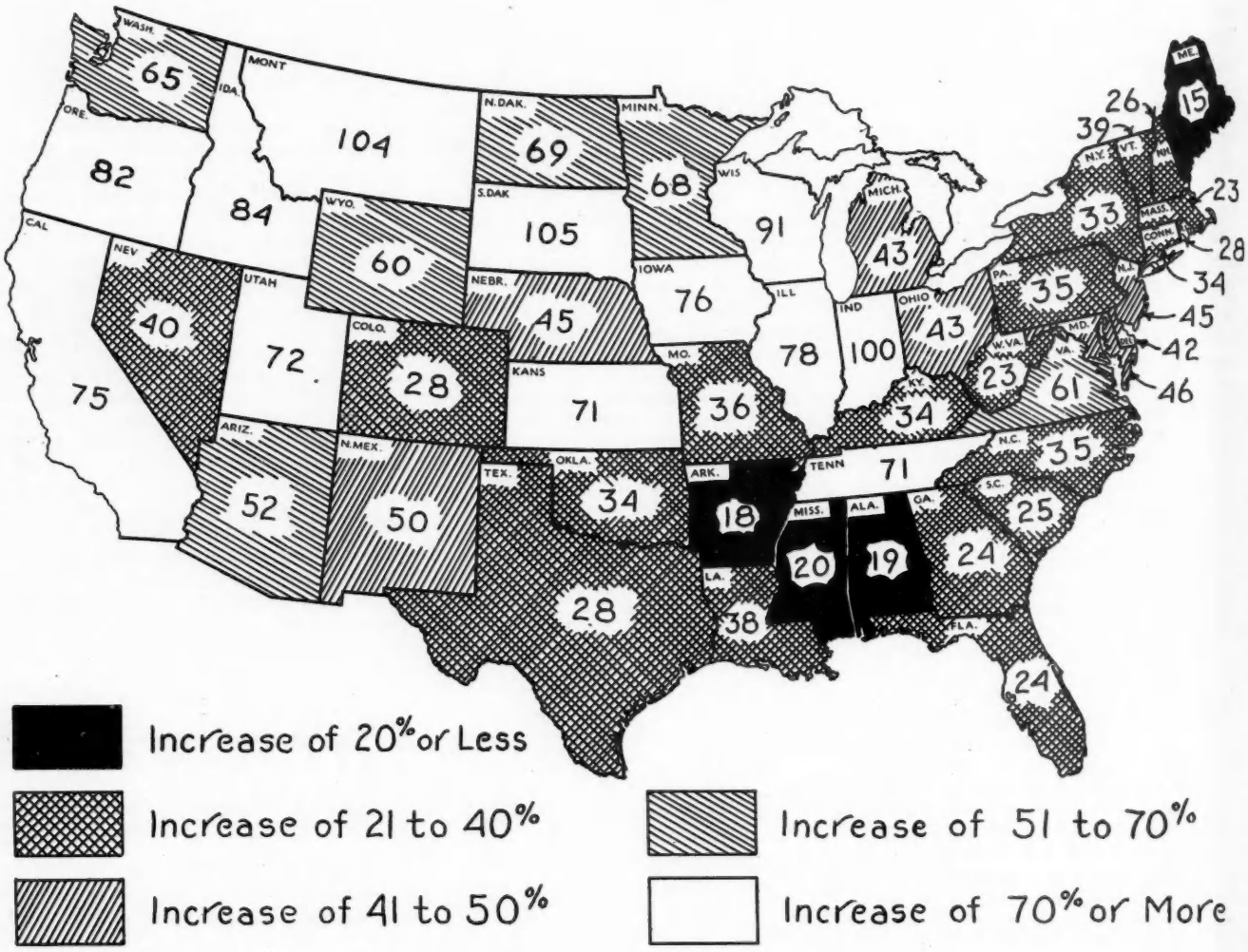
Referring to the earlier automobile show date this year, Mr. Knudsen pressed the opinion that the current year is not likely to borrow business from 1936. "One year won't change the peoples' buying habits much. Our projections for the four months following the show credit the earlier introductions with only 2 per cent more business than these months would produce if the show came the first of the year. The real benefit will come from the spread of employment, of having four months instead of two to build up dealer stocks. The rush we have experienced in other years has been costly and unsatisfactory. In general, the new scheme is much better."

He said that material prices are steadier than they were a year ago and that car prices also are steady. He doubted that there would be any reductions in steel prices for the balance of the year, much as he might hope for them. The industry probably will turn out around 3,600,000 units this year, he estimated.

R. H. Grant, vice-president in charge of sales and newly elected member of the GM executive committee, predicted a bigger year for the motor industry next year. He based this view on two factors. "Obsolescence," he said, "is demanding replacements and this demand is so insistent that nothing can stop it." Also, the lag from the depression has not been taken up and will not be this year. "More of the fill-up business will come in 1936."

Like other sales executives of the motor industry, Mr. Grant counts strongly on the increased buying power of agriculture, calling attention to the fact that the projected farm income this year is 7½ billion dollars against 5 billion last year.

First Half Totals Surpass Even



New Passenger Car Registrations by States
First Six Months of 1935 and 1934 Compared

	1935	1934		1935	1934		1935	1934
Alabama	13,320	11,162	Maine	7,888	6,859	Oklahoma	26,597	19,808
Arizona	4,739	3,107	Maryland	18,818	12,860	Oregon	12,520	6,897
Arkansas	8,992	7,625	Massachusetts	51,586	42,047	Pennsylvania	104,608	77,491
California	99,526	56,914	Michigan	99,531	69,677	Rhode Island	8,469	6,604
Colorado	13,295	10,336	Minnesota	34,314	20,384	South Carolina	11,675	9,332
Connecticut	20,342	15,129	Mississippi	9,093	7,591	South Dakota	6,809	3,168
Delaware	3,703	2,597	Missouri	43,825	32,103	Tennessee	20,965	12,293
District of Columbia	15,938	10,078	Montana	9,881	4,941	Texas	70,237	55,015
Florida	16,866	13,615	Nebraska	17,469	12,026	Utah	5,873	3,405
Georgia	22,003	17,736	Nevada	1,758	1,256	Vermont	3,726	2,680
Idaho	6,241	3,391	New Hampshire	5,664	4,480	Virginia	23,561	14,667
Illinois	98,422	55,192	New Jersey	50,005	34,547	Washington	18,210	11,030
Indiana	51,950	25,908	New Mexico	3,603	2,389	West Virginia	13,885	11,249
Iowa	35,312	20,105	New York	133,737	100,686	Wisconsin	40,627	21,192
Kansas	26,651	15,538	North Carolina	25,919	19,113	Wyoming	3,489	2,182
Kentucky	20,208	15,087	North Dakota	6,761	3,998			
Louisiana	14,042	10,158	Ohio	99,287	69,473	Total	1,461,940	995,121

Most Optimistic Expectations

by Don Blanchard
Editor, Automotive Industries

THE story of the first half told by automotive statistics is one that far surpasses the most optimistic earlier hopes of an industry that is noted for its optimism. This is true not only of production and sales, but also of profits, employment and payrolls.

Production in the first six months exceeded last year by 32 per cent with passenger cars gaining 34 per cent and trucks 26 per cent. Total output was the best for any six months period since 1929.

New vehicle registrations figures indicate that first half sales in the United States were up 44 per cent. Passenger car sales increased 47 per cent while trucks registered a gain of 31 per cent. Total exports of 315,411, consisting of 223,339 cars and 92,072 trucks, also showed a nice increase.

Dollar volume does not compare so favorably with 1929 as do unit figures as the lower-priced cars and the lighter trucks continued their domination of the market. Detail comparisons of production by wholesale price classes and by capacities were given on pages 140 and 141 of last week's issue. Tables showing estimated sales by price classes accompany this article.

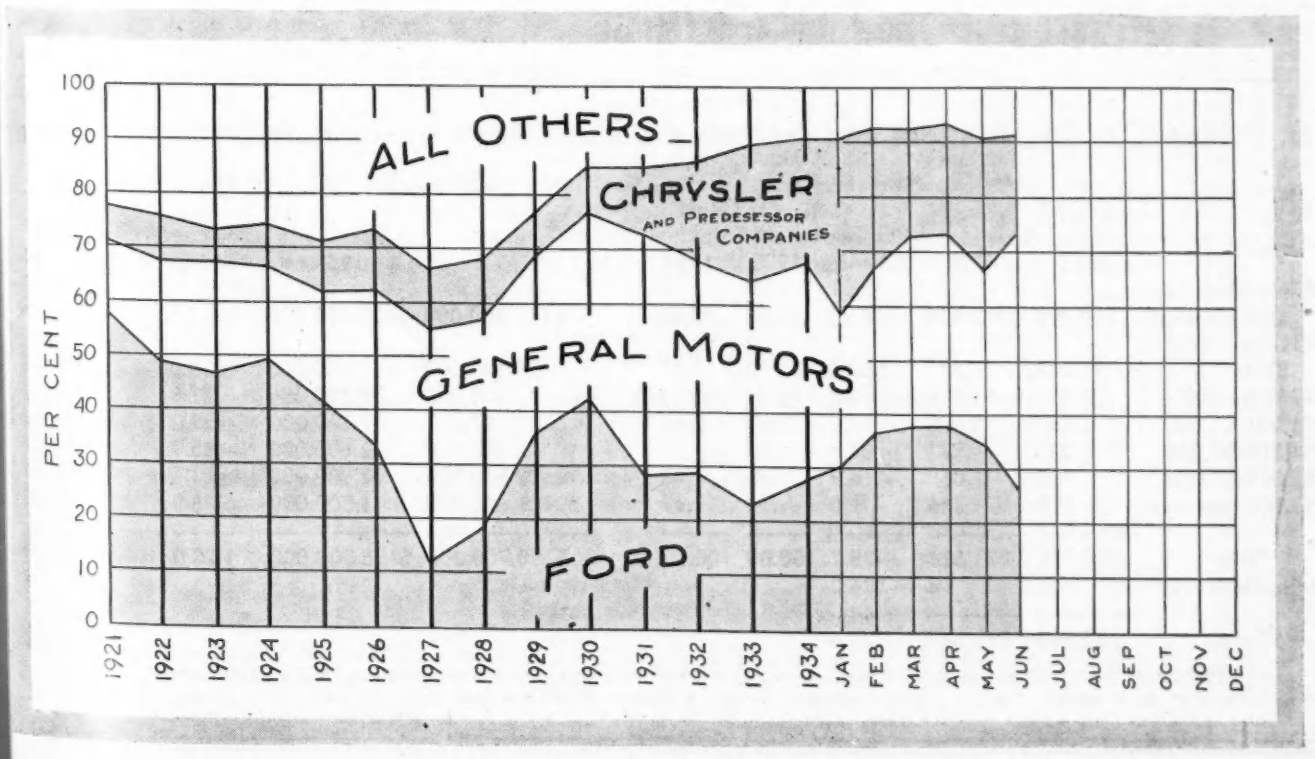
These tables show that in the first half the American public spent an estimated $1,014,100,000 for new cars at list prices, an increase of 43.5 per cent against a gain in unit volume of 46.9 per cent. The average list price paid in the first half was $695 against $710 last year.

Comparison of factory sales to dealers with registration figures indicates that field inventories of new vehicles increased 342,050 units in the first half, the increase being made up of 277,540 cars and 64,510 trucks. It is believed, however, that the actual increase in stocks was less than these figures indicate due to the lag in registrations.

Unfortunately there are no figures on used car stocks, but they unquestionably are considerably higher than a year ago and their liquidation is going to entail considerable loss for dealers who are in none too good shape to absorb it. Continued losses have sapped their capital to the point that it was necessary for the finance companies to provide inventory financing to the extent of $700,000,000 in the first half as compared with $556,000,000 in the corresponding period last year. Some of this increase was due to the fact that this year finance companies are helping dealers carry used car inventories where heretofore they have generally limited their wholesale activities to new cars.

Manufacturing profits have blossomed as volume has expanded. A tabulation present in last week's issue covering 12 vehicle manufacturers and 23 parts companies showed total first half earnings of $124,877,840 against $85,304,860 in 1934. With the second half promising more than normal volume due to the earlier introduction of new

How Passenger Car Production Was Divided



First Half Statistics

	Cars	Trucks	Total
Production—1935	1,962,819	410,645	2,373,464
—1934	1,469,285	327,062	1,796,347
Per Cent Increase	34	26	32
Registrations—1935	1,461,940	254,063	1,716,003
1934	995,555	194,744	1,190,299
Per Cent Increase	47	31	44
Sales to U. S. Dealers—1935	1,739,480	318,573	2,058,053
Exports (including Canada)	223,339	92,072	315,411

models, the year's earnings record should come close to being the best since 1929.

Among the 12 vehicle makers included in that tabulation, three of them show losses but these deficits are smaller than in the previous year. Four of these companies, which were in the red last year, reported black ink for the first half of this year. Only two of the 23 parts companies report losses.

Production, employment and payroll data are summarized in one of the accompanying tables.

*Data on individual car makers for the first half follow:

FORD production in the United States and Canada totaled 810,700 units against about 500,000 in the same period last year, an increase of 62 per cent. With 488,468 new cars and 97,314 new trucks registered in the United States, the company led in the domestic margin by a wide margin. Corresponding totals in the first six months of last year were 295,280 and 61,503, making percentage gains this year of 65.8 and 58.1 per cent respectively.

LINCOLN domestic sales in the first half were 12 per cent under last year with production showing a substantially larger loss. The advent of the new medium-priced Lincoln, of course, will change this picture materially.

GENERAL MOTORS' passenger cars enjoyed an increase in production in the first half of about 20 per cent. In the domestic market, the corporation's registrations of new passenger cars was up 34 per cent. World sales of cars and trucks were up 18 per cent.

BUICK domestic sales increased 10 per cent although production was off by about the same amount. The Model 40 is estimated to have produced about two-thirds of this division's business in the first half.

CADILLAC was off both in production and domestic registrations, the decrease in registrations amounting to 9 per cent.

CHEVROLET, despite production delays early in the year and labor troubles in May, had an increase of 16 per cent in new car registrations and a gain of 9.5 per cent in new truck sales in the first half. The gain in car production was of smaller proportions. The division appears to be well on the way toward reaching the goal of 200,000 set for its standard model. Sales of the Master model, which suffered most from the production difficulties, are behind last year at the end of six months.

LA SALLE doubled last year's first half registrations in the first six months of this year. Production is estimated to have increased close to 80 per cent.

OLDSMOBILE more than doubled its production in the first half and increased its domestic sales by 134 per cent. The phenomenal popularity of its six-cylinder model was largely responsible for these big gains although the eight also registered very substantial increases.

PONTIAC domestic registrations were up 80 per cent in the first half with production larger in nearly the same ratio. The new six was responsible for the huge gain since eight-cylinder sales were under last year.

CHRYSLER MOTORS had an increase in passenger car production in the first half of over 25 per cent and an increase in new car registrations of 53.4 per cent.

CHRYSLER gained 85 per cent in domestic new car sales in the first half.

All comparisons are between the first six months of this year and the corresponding period last year. All sales figures are based on U. S. registrations of new vehicles. Production comparisons are based on estimates by Automotive Industries.

U. S. New Car Registrations and Estimated Dollar Volume by Retail Price Classes—June

	UNITS					ESTIMATED DOLLAR VOLUME*				
	1935	1934	Per Cent Change	Per Cent of Total 1935	Per Cent of Total 1934	1935	1934	Per Cent Change	Per Cent of Total 1935	Per Cent of Total 1934
Chevrolet, Ford and Plymouth	189,590	162,938	+16.3	67.64	72.86	$113,300,000	$102,400,000	+10.8	59.42	64.44
Others under $750	41,248	6,873	+500.0	14.72	3.07	29,300,000	4,900,000	+498.0	15.36	3.08
$751-$1,000	38,513	45,118	—14.6	13.74	20.18	32,600,000	37,300,000	+12.6	17.09	23.47
$1,001-$1,500	9,460	5,655	+67.7	3.37	2.53	11,000,000	7,100,000	+55.0	5.77	4.47
$1,501-$2,000	200	1,587	—87.5	.07	.71	400,000	2,800,000	—85.7	.21	1.76
$2,001-$3,000	908	1,067	—14.9	.32	.48	2,500,000	2,900,000	—13.7	1.31	1.83
$3,001 and over	390	386	+1.0	.14	.17	1,600,000	1,500,000	+6.8	.84	.95
Total	280,309	223,624	+25.2	100.00	100.00	$190,700,000	$158,900,000	+20.0	100.00	100.00
Miscellaneous	51	18	+184.0							
Total	280,360	223,642	+25.6							

*All calculations are based on list price F.O.B. factory of the five-passenger, four-door sedan in conjunction with actual new car registrations of each model. The total dollar volumes for the different models are then consolidated by price classes.

Public Spends Over a Billion for New Cars in the First Half

U. S. New Car Registrations and Estimated Dollar Volume by Retail Price Classes—Six Months

	UNITS					ESTIMATED DOLLAR VOLUME*				
	1935	1934	Per Cent Change	Per Cent of Total 1935	Per Cent of Total 1934	1935	1934	Per Cent Change	Per Cent of Total 1935	Per Cent of Total 1934
Chevrolet, Ford and Plymouth	1,013,689	722,675	+40.3	69.36	72.64	$628,400,000	$450,400,000	+39.5	61.96	63.74
Others under $750	206,091	52,544	+292.0	14.10	5.28	147,400,000	36,600,000	+303.0	14.54	5.18
$751-$1,000	191,625	171,516	+11.3	13.11	17.24	162,300,000	141,400,000	+14.9	16.00	20.01
$1,001-$1,500	38,732	32,471	+19.5	2.65	3.26	46,100,000	40,100,000	+14.9	4.55	5.68
$1,501-$2,000	4,406	7,946	—44.6	.30	.80	7,400,000	14,000,000	—47.2	.73	1.98
$2,001-$3,000	4,629	5,720	—19.2	.32	.57	12,700,000	15,800,000	—19.6	1.25	2.24
$3,001 and over	2,350	2,085	+13.0	.16	.21	9,800,000	8,300,000	+18.1	.97	1.17
Total	1,461,522	994,957	+46.9	100.00	100.00	$1,014,100,000	$706,600,000	+43.5	100.00	100.00
Miscellaneous	418	164	+155.0							
Total	1,461,940	995,121	+46.9							

*All calculations are based on list price F.O.B. factory of the five-passenger, four-door sedan in conjunction with actual new car registrations of each model. The total dollar volumes for the different models are then consolidated by price classes.

The larger part of this gain is understood to have been registered by the Airstream models. The increase in first half production is estimated at between 20 and 25 per cent.

DE SOTO domestic sales rose 153 per cent in the first half while production more than doubled, due to the addition of the Airstream series selling at substantially lower prices than the Airflow models which made up the entire line in 1934.

DODGE car registrations increased 96 per cent while truck registrations gained 31 per cent. Car production was up about 60 per cent.

PLYMOUTH sales in the domestic market as indicated by registrations increased 34 per cent. Production is estimated to have increased between 10 and 15 per cent.

AUBURN increased its U. S. registrations 31 per cent while holding production at substantially the same level as last year.

GRAHAM registrations were up 19 per cent, with production up by a slightly larger percentage.

HUDSON domestic volume increased 6 per cent although estimated production was under last year.

TERRAPLANE production also is estimated at less than last year, but U. S. registrations were up 27 per cent in the first half.

HUPMOBILE domestic volume was 60 per cent higher on a production increase of about 40 per cent.

LA FAYETTE, which changed models during the first half, had only a small increase in production, but its registrations were 178 per cent larger, due in part of course to production delays last year.

NASH registrations decreased one per cent due to the fact that in the early months of the year there was no low-priced Nash six. The "400" series took care of this condition. Production in the first half increased an estimated 15 per cent.

PACKARD volume has soared with the addition of the 120, its increase in registrations amounting to 372 per cent and in production to roughly 700 per cent. However, sales of its higher-priced cars were larger than last year.

PIERCE-ARROW registrations down 60 per cent with production showing a somewhat larger loss.

REO domestic car sales were up 4 per cent while trucks showed a 4 per cent decrease. Car production showed a small increase.

STUDEBAKER registrations were down 8 per cent but truck sales increased 28 per cent. Car production was practically the same as last year.

WILLYS registrations were up 52 per cent with production increasing by about the same amount.

Automotive Indexes—First Half

	1929	1934	1935
Production	164	87	115
Employment	125	104	115
Payrolls	131	89	105
Pay per worker	105	86	91
Employment per car	76	120	100
Payroll per car	80	102	91

Based on Federal Reserve Board and Bureau of Labor Statistics indexes.

What Is

by P. M. Heldt
Engineering Editor, Automotive Industries

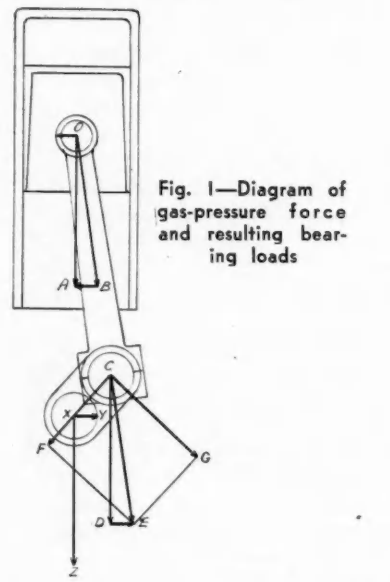


Fig. 1—Diagram of gas-pressure force and resulting bearing loads

IT may seem futile to speculate on the exact nature of engine "roughness." Everyone knows that roughness is vibration and noise and that it is a very undesirable characteristic of engine operation. It is also generally known that it can be reduced by stiffening the structural parts of the engine, and particularly the crankcase. What more, then, is there to be said about the subject?

There are two other forms of engine vibration and noise which have been the subject of much study in recent years; namely, detonation or "pinging," and torsional vibration. By comparison with these two subjects, very little has appeared in the technical press and in technical book literature regarding the nature of roughness, and yet we have every reason to believe that this phenomenon will yield to the same methods of analysis that have been applied in the case of torsional vibration. Such an analysis will be attempted in the following.

Assuming that the various rotating parts of the engine are properly balanced, there are just two possible sources of vibratory forces in an internal combustion engine—variations in the gas pressure and variations in the inertia forces of the reciprocating parts. The first of these alone is responsible for "pinging," while both have something to do with torsional vibration.

Any sustained vibration of considerable magnitude, of course, must involve the element of resonance. That is, the vibrating body must be subjected to vibration-exciting forces of substantially the same frequency as its own frequency of free vibration. If the vibration-inducing forces had only a single frequency, there would not be much trouble from synchronous vibration, because the basic frequency of these forces is usually comparatively low, and it would not be difficult to make the engine structure so stiff, and its frequency of natural vibration so high that the frequency of the impulses would not be equal thereto even at the highest engine speeds. However, we know from Fourier's theory that any periodic force or moment can be replaced by a single constant mean force and a series of harmonics of which the first has the same frequency as the basic impulse itself and the remainder have frequencies 2, 3, 4, 5, etc., times as high. This theorem applies whether the basic force or moment is unidirectional or reversible. Of course, if the force is reversible and acts equally in both directions, then the mean force is equal to zero and the equivalent is merely the series of harmonics. In many cases it is one of the higher harmonics that comes into synchronism with the vibrating body and causes trouble.

In the case of the gaseous pressure in an engine we have a unidirectional force, since the gas pressure naturally always acts downward on the piston in a vertical engine. The constant downward force then is such that if it acted on the piston in the direction of piston travel throughout the four strokes, it would accomplish as much work as the net result of the gas pressure on the piston during the power stroke and the air pressure during the compression stroke. To have a complete equivalent of the periodic impulses due to the gas pressure we have to have, in addition to this constant force, a series of harmonic forces of frequencies equal to 1, 2, 3, 4, etc., times the frequency of the combustion cycle.

The gas pressure creates equal forces

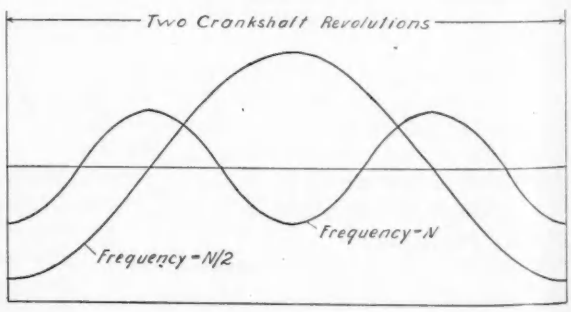


Fig. 2—First and second harmonics of a force due to cylinder gas pressure

Engine Roughness?

Horizontal as well as vertical rigidity of crankcase needed to insure quiet operation

upward against the cylinder head and downward against the main bearings of the engine, which would seem to indicate that these forces are completely taken up within the engine and have little opportunity to cause vibration. The center of the pressure on the cylinder head is in the axis of the cylinder, and so is that of the vertical load on the two bearings adjacent to the cylinder concerned, hence the two forces act along the same line, and since they are equal they balance each other. The only motion of parts of the engine block they could produce would be due to elastic "stretch" of the block in the direction of the cylinder axis, and owing to the relatively high modulus of elasticity and low elastic limit of cast iron, any such motion must be very restricted.

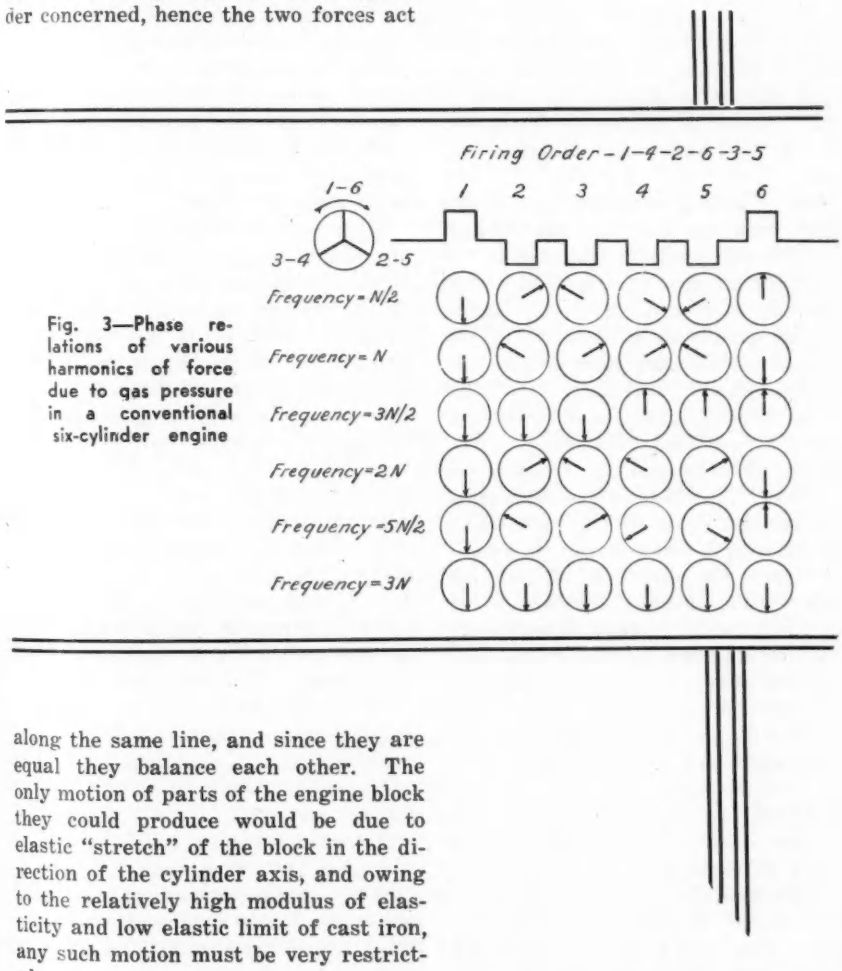


Fig. 3—Phase relations of various harmonics of force due to gas pressure in a conventional six-cylinder engine

In this connection we must remember that the force of the gaseous explosion is transmitted to the main bearings, not by direct downward thrust, but through the connecting rod and the crank arm, which, except for the two dead-center positions, make an angle with the axis of the cylinder and then introduce a transverse or horizontal component. The connecting rod, being articulated at both ends, can transmit a force only in the direction of its shank and, when the rod makes an angle with the cylinder axis, this force naturally has one component in the cylinder axis and another at right angles thereto, which latter in what follows will be called the horizontal component.

The various forces involved are represented diagrammatically in Fig. 1. The gas pressure, *OA*, on the piston crown creates a thrust, *OB*, along the shank of the connecting rod and a side thrust, *AB*, against the cylinder wall. *CE* also represents the thrust along the connecting rod. This is transmitted to the crank arm in the form of a radial force, *CF*, acting along the crank arms in the direction from the crankpin toward the main bearings, and a tangential force, *CG*, (equal to *FE*), which acts at point *C*. The forces transmitted to the crank arm by the connecting rod are finally taken up on the main bearings, where they appear as a vertical bearing load, *CD*, or *XZ*, and a horizontal bearing load, *DE*, or *XY*. It is this horizontal component of the bearing load on the main bearings with which we are concerned for the moment.

This horizontal load on the bearing due to gas pressure passes through one complete cycle once during every two crankshaft revolutions. Taking a conventional engine turning right-handedly (looked at from the front), the horizontal bearing load due to gas pressure is toward the right during the power stroke and toward the left during the compression stroke. There is no gas pressure of any consequence in the cylinder during the exhaust and inlet strokes, and during these two strokes, therefore, the horizontal bearing loads due to gas pressure are nil.

Here again we have a uniformly recurring force to which Fourier's theory applies. All of the main bearings of the engine are subjected to horizontal reciprocating forces which may be resolved into a series of harmonic forces of frequencies 1, 2, 3, 4, etc., times that of the recurring force as a whole. This force as a whole, and these harmonics, tend to displace the crankshaft bearings horizontally, and there is no direct opposing force tending to prevent move-

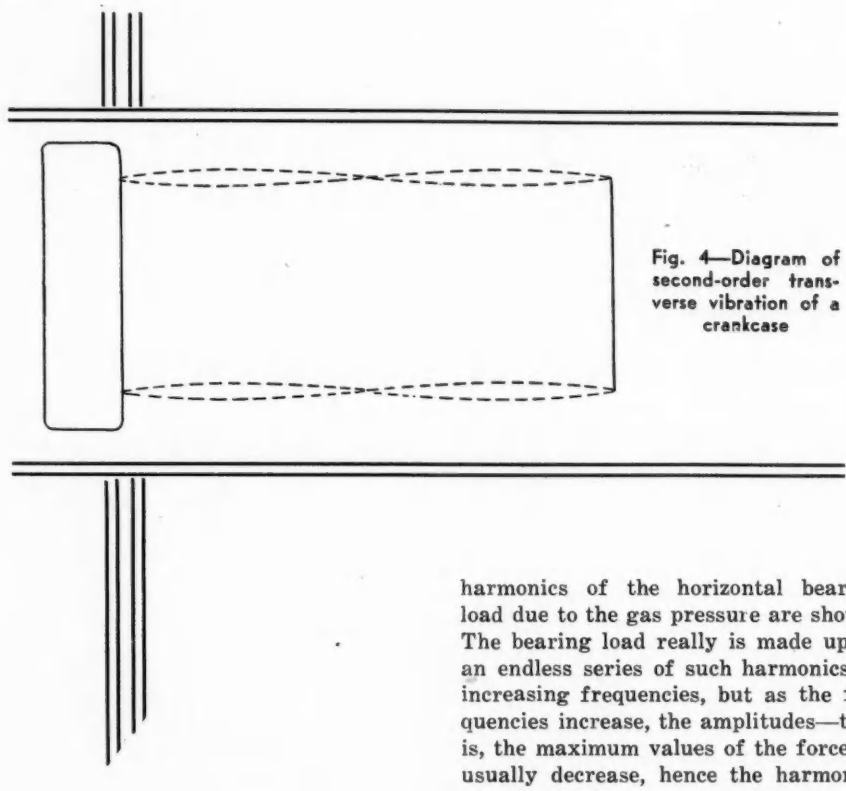


Fig. 4—Diagram of second-order transverse vibration of a crankcase

ment, such as the gas pressure against the cylinder head tending to keep the bearings in place against vertical forces. There is, of course, the side thrust against the cylinder walls, which is equal and opposite in direction to the horizontal bearing loads, but this acts at considerable distances above the horizontal plane of the main bearing axis, so that it can have very little effect in preventing displacement of the bearings horizontally.

The first two of the harmonics of the bearing loads in the horizontal plane due to gas pressure are represented by the two curves in Fig. 2. In this graph horizontal distance represents time and vertical distance the momentary magnitude of the horizontal bearing load. The first harmonic passes through one complete cycle in two revolutions of the crankshaft, and if the revolutions of the crankshaft per minute are represented by N, then the frequency of this first harmonic is $N/2$. For the sake of those not familiar with the subject it may be explained that a harmonic force is a periodic force which varies with time in such a way that the magnitude of the force at any time during the cycle is proportional to the sine of an angle which bears the same proportion to 360 deg. as the time elapsed since the beginning of the cycle bears to the period, or the total time of the cycle. The force reverses its direction when the sine changes its sign, at 180 and 360 deg., or when the cycle is half-completed and when it is completed. In Fig. 2 only the first two harmonics of the horizontal bearing load due to the gas pressure are shown. The bearing load really is made up of an endless series of such harmonics of increasing frequencies, but as the frequencies increase, the amplitudes—that is, the maximum values of the forces—usually decrease, hence the harmonics of very high order are of no importance.

Now let us take a six-cylinder in-line engine with the conventional 120-deg. crank arrangement. A diagram of the crankshaft of such an engine is shown at the top in Fig. 3. Since the explosions or gas-pressure impulses in the different cylinders are phased differently, the various harmonics are also phased differently for the different cylinders. These harmonics can be conveniently represented by vectors. A vector is a line whose length represents the maximum value which the variable force attains, in other words, its amplitude, while the direction of the line represents the phase of the force.

In the series of circles immediately below the diagram of the crankshaft are shown vectors representing the first harmonics of the horizontal bearing loads due to gas pressure impulses in the six cylinders. It may be well to point out that the directions of the vectors do not represent the directions of the forces. All of the forces act horizontally at right angles to the crankshaft axis at all times, and the direction of the vectors (or arrows) merely indicates whether the force is toward the right or the left at the moment, and whether it is increasing or decreasing. For instance, the vector in the first circle under crank 1 extends vertically downward, which indicates that the first harmonic is directed to the left at the moment and is at its maximum value. From the firing order it will be seen that the next cylinder to fire is No. 4. This fires 120 deg. of crankshaft travel after No. 1. However, the first harmonic has only half the frequency of crankshaft rotation, and 120 deg. of crank travel is equal to 60 deg. of the cycle of the first harmonic. Hence, in the first circle under crank 4, the vector is shown 60 deg. back of (in the counterclockwise direction from) the vector directly under crank 1. The next cylinder to fire is No. 2, and the vector for this is 60 deg. back of that for No. 4 and 120 deg. back of that for No. 1. Next follows cylinder No. 6, and the vector for this is 60 deg. back of that for No. 2, 120 deg. back of that for No. 4, and 180 deg. back of that for No. 1. The vectors for the remaining cylinders follow in the firing order, each being at an angular distance of 60 deg. in the counter-clockwise direction from the one immediately preceding it.

It will be seen that in three of the cylinders the bearing loads are directed to the right (upwardly directed vectors), and in three to the left (downwardly directed vectors). The resultant of all six is nil. Therefore, the first harmonic of the horizontal bearing loads due to gas pressure can not produce any vibration of the crankcase in the horizontal plane.

The second harmonic of the gas-pressure forces in the different cylinders, which are represented by the vectors in the second line of circles, have a frequency N, that is to say, they pass through a complete cycle during one crankshaft revolution. Therefore, when this harmonic attains its maximum value to the left, as indicated by the first vector, the harmonic of cylinder 4 (the cylinder next to fire) is 120 deg. from the straight left position in the counter-clockwise direction, the harmonic of cylinder 2, 240 deg. from the straight left position in the counter-clockwise direction, and so on. In this case the harmonics of the two end cylinders are at their maximum value to the left, while the harmonics of the four inner cylinders are directed toward the right and at one-half their maximum value. The resultant of all six again is nil.

The third harmonic of the gas-pressure force has a frequency of $3N/2$ and therefore passes through one and one-half cycles during one crankshaft revolution. The phases of the harmonics in succeeding cylinders of the firing order therefore are separated by 180 deg. In this case there evidently is some slight possibility of synchronous vibration. However, with a crankcase supported at opposite ends, the vibration would have to be of the second order, with the node at the center, as illustrated diagrammatically in Fig. 4. The natural period of vibration of this order, of even a moderately rigid crank-

case would be very high, and the chances of resonance are practically nil.

The vectors of the fourth and fifth harmonics are distributed similarly to the second and first respectively, and they therefore are not likely to cause vibration. It is when we come to the sixth harmonic of the gas-pressure bearing load, which has a frequency equal to three times the crankshaft speed, that we find a potential cause of serious vibration. Since the frequency of this harmonic is $3N$, the harmonics of the cylinders following each other in the firing order, are separated by 3 x 120 deg., or a complete cycle, and the harmonics of all cylinders are therefore in phase.

This is illustrated in Fig. 5, which shows a transverse section through the crankcase of a six-cylinder engine at the crankshaft axis. As there are seven main bearings, the sixth harmonics of the six cylinders are divided between these. Since the harmonic from each cylinder is equally divided between the two main bearings on both sides of it, it follows that the resulting forces on the two end bearings are only half as great as those on the intermediate bearings, and this is indicated in the drawing. The result of such lateral simultaneous forces on all of the main bearings is, of course, to deflect the crankcase laterally. The force which causes this deflection is an alternating force whose frequency goes up and down with the engine speed. If the engine crankcase is not very stiff laterally, it is likely that its natural rate of vibration in the transverse direction is sufficiently low so that at some point of the engine speed range the sixth harmonic of the transverse load on the main bearings due to gas pressure in the cylinders will be in resonance with it, in which case we will have a critical speed of rough operation.

In addition to the sixth harmonics, the twelfth, eighteenth, twenty-fourth (etc.) harmonics also are in phase on all of the main bearings, and are capable of producing vibrations of the same kind as the sixth harmonics. These higher harmonics come into resonance with the crankcase at lower engine speeds, but, fortunately, their amplitudes are less than that of the sixth harmonic, hence they are less dangerous.

It may be pointed out in this connection that a crankcase of conventional design, unless very wide flanges or ribs extend along its length at about the height of the crankshaft axis, is not very stiff laterally. The partitions or bulkheads which carry the bearings undoubtedly add something to the stiffness of the shell, but not nearly as much as substantial longitudinal ribs or flanges extending from the front to the rear wall of the case.

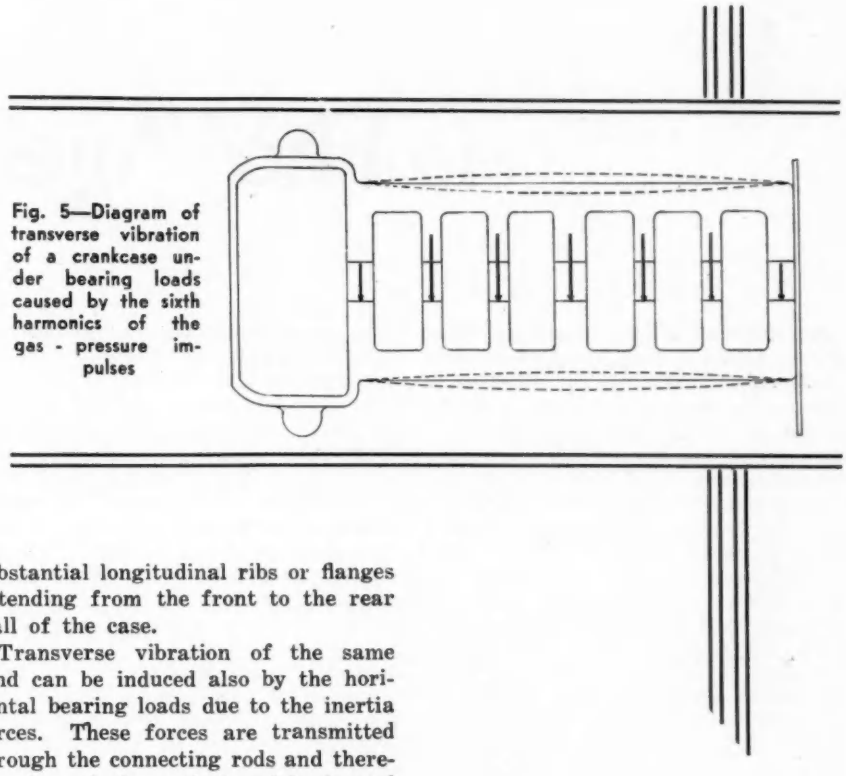


Fig. 5—Diagram of transverse vibration of a crankcase under bearing loads caused by the sixth harmonics of the gas - pressure impulses

Transverse vibration of the same kind can be induced also by the horizontal bearing loads due to the inertia forces. These forces are transmitted through the connecting rods and therefore have both vertical and horizontal components, the same as the gas-pressure force transmitted through the connecting rods. The one difference between the gas pressure forces and the inertia forces is that the frequency of the latter is twice that of the former, so that the second harmonic of the gas-pressure force has the same frequency as the first harmonic of the inertia force.

As regards the inertia forces, they evidently can produce vibration of the engine block also in the vertical plane. The inertia forces do not act on the cylinder heads like the gas pressures, and at any one time the inertia force on the reciprocating parts in one cylinder acts either upwardly or downwardly on the cylinder block, the reaction to this force being taken by the masses in motion—the piston and upper end of the connecting rod.

The phase relations of the forces due to the masses in the different cylinders are similar to those of the forces due to the gas pressure. The inertia forces pass through a complete cycle during one crankshaft revolution and therefore have the same frequency as the crankshaft motion. Since the various cranks of the six-cylinder engine are spaced 120 deg., it follows that the third harmonics of the inertia force differ in phase by 3 x 120 deg., or a whole cycle. In other words, the third harmonics of the inertia forces on all cranks are in phase. The vertical components of these forces, as they are transmitted to the main bearings through the connecting rods, tend to flex the engine block in the vertical plane, while the horizontal components tend to flex it in the horizontal plane. Similarly the sixth, ninth, twelfth, etc., harmonics of these forces. It is thus evident that the engine blocks must be made rigid both in the horizontal and in the vertical direction. That great vertical stiffness is required to assure quiet operation was recognized long ago, when the practice was adopted of carrying the sides of the crankcase down a considerable distance below the crankshaft axis. Casting the cylinders and crankcase in a single unit also tends in the same direction, but it is likely that this practice was first adopted for reasons of economy, because it dates back to a time when engine speeds were still quite low and when the chances of resonance between the lower harmonics of the gas pressure and inertia forces and the engine block were not very great.

In an eight-cylinder in-line engine with the conventional crankshaft the lowest harmonics that are in phase on all crank throws are the eight of the gas pressure force and the fourth of the inertia; all multiples of these harmonics, that is, the sixteenth, twenty-fourth, thirty-second, etc., harmonics of the gas-pressure force and the eighth, sixteenth, twenty-fourth, etc., of the inertia force are also in phase. For a given engine speed the eighth harmonic, of course, has a higher frequency than the sixth, and since the eight-cylinder crankcase, because of its greater length, is likely to be less rigid transversely, the chance of roughness is evidently considerably greater in an eight than in a six.

The Age Distribution o

On this and following pages, Automotive Industries presents the full text of the AMA report on its study of the age of automotive employees in the industry itself and in other industries. The facts indicate that charges that the industry discriminates against old workers, are without foundation.

COMPUTATIONS founded upon the U. S. Census of Occupation Reports on Age Distribution of gainfully employed males by industries, covering 1920 and 1930, and upon more recent data gathered from automobile manufacturing concerns present a strong indication that the proportion of older factory employees is governed in large part by the rate of expansion or contraction in total employment experienced by any industry or company.

Comparison between the census data on age distribution and the statistics on industry expansion, shows that with very few exceptions rapid growth of industries and individual concerns has been accompanied by a corresponding reduction in the proportion of older employees, and, conversely, in those industries which were stable or showed a decline in employment, the percentage of older men increased.

So regular is the recurrence of this finding in the employing units examined that it seems fair to conclude that change in the average age of those employed is in large measure a function of the industry's employment growth.

The data here analyzed, which were obtained from the U. S. Census reports, cover 67 manufacturing industries. Comparable census figures on age distribution by industries for both 1920 and 1930 are available only for unskilled and semi-skilled classifications. The highly skilled classifications for which comparable data are not available and which are, therefore, omitted from this study, are the ones in which the older worker is generally conceded to hold an advantage over less experienced younger competitors. The result of the present calculations may therefore reasonably be accepted as applying to the whole of employment.

The existence of this definite relation between change in proportion of older employees and rate of industry growth makes more striking the fact that a few industries, automobile manufacturing among them, moved against the normal trend and actually *increased* their percentage of older men employed during a decade in which their total employment expanded sharply.

Total employment (exclusive of skilled workers) in the automobile industry is shown by the census to have increased 39 per cent from 1920 to 1930. But, unlike the case in most similarly growing industries, the number of men at or above the age of 45 had increased at an even greater rate (51.3 per cent).

Had the age ratio followed the normal or typical relationship shown by other industries growing at a comparable rate, the number of men over 45 would have increased only 28.5 per cent, and the industry would have shown a decline in the proportion of employees included in the highest age bracket.

The result of this departure from the usual pattern is that, relative to its rate of growth, the automobile industry during the decade 1920-30 increased its employment of older men more than most other American manufacturing industries.

Available records of individual automobile companies during the period 1930-1934 show a relationship of change in age distribution to change in employment similar to that presented by analysis of the census figures on 67 industries during the 1920-1930 period. The post-census automobile records show a decline in the proportion of older workmen in those companies which experienced rapid expansion, and show increases in the companies with stationary or declining employment.

In addition, this section of the study includes evidence that older workers in this industry held a conspicuous advantage both in continuity and volume of employment and in annual earnings.

Analyzing the individual records of more than 75,000 men employed by 14 plants in the industry during the production year 1933-1934, it was found that lay-offs made necessary by declining production at the end of the season were distributed to the advantage of older workers, to the extent that men of 50 and over were given, on an average, 49.3 per cent more hours of employment during the year than those under 30 years of age. A steady progression obtained through the intervening age brackets.

For this same group of men it was found that the annual average earnings increased with advancing employees' ages, the group between 55 and 60 receiving the highest average. Men of 50 and more received, on the average, an individual annual wage of 64.1 per cent above that paid men under 30 years of age.

It should be noted that the conditions cited above, for the production year 1933-1934, preceded in large part the formal adoption of the seniority system now in vogue in the automobile industry.

No effort is made here to draw conclusions as to why the automobile industry, contrary to the general tendency, increased its employment of older men at a rate greater than its rapid expansion of total employment.

Since the 1920-1930 period was one in which the industry underwent a great increase in mechanization and

Table I

All Gainfully Employed Males in All Occupations

Age Group	1920	1930	% Increase
Total all ages	33,064,737	38,077,804	15.2
Under 25 yrs.	7,383,064	7,824,509	6.0
25 to 44 yrs.	15,579,586	17,776,868	14.1
45 and over	10,045,012	12,445,398	23.9
Unknown	57,075	31,029	...
Increase in *proportion* of employees 45 and over			7.5

# of Automotive Workers

much change in production methods, the present findings have a direct bearing on any conclusions which may be reached as to the results of evolution in manufacturing processes upon continued employment of older men, and suggests new and important lines of investigation.

These facts indicate that neither changes in manufacturing methods nor increased output obtained by greater use of machinery, tended to eliminate or decrease the usefulness of the man of 40, 45 or even older in this industry.

Since there was no concerted effort on the part of this industry between 1920 and 1930 to increase the employment of older men, the result must have come from normal employment policies and factory requirements.

The United States Government, in its decennial census, presents the most prolific and reliable information regarding the ages of gainfully employed persons in the country and from this source the tabulation showing the 1920 and 1930 age distribution of all male gainful workers 10 years old and over was obtained. (See Table 1.)

For individual industries the Census of Occupations of 1920 does not show ages of skilled employees. Ages of "laborers and operatives," that is, unskilled and semi-skilled workers, is the only information available. The table on this page shows the distribution of the ages of these employee groups for all manufacturing and mechanical industries and for the automobile industry. (See Tables 2 and 3.)

The laborers and operatives covered by these tabulations constituted over 44 per cent of the total number employed in the automobile manufacturing industry in 1930 and more than 35 per cent of the total in 1910 (1920 figures not available. These two groups may thus be considered as fairly representative of all employees in automobile factories.

Moreover, it must be borne in mind that these laborers and operatives are the least skilled of the employees in automobile factories. It has been established that the highly skilled employees are less handicapped by age than less skilled groups. This has been found to hold for all branches of industry.

The following quotation from Professor William M. Leiserson's study of "The Older Worker in Dayton's Industries" is pertinent:

"What is established beyond a doubt by the data collected is that men that have skilled trades are both hired and kept at work up to much older ages than unskilled employees. So far as men who have been apprenticed and learned a craft are concerned, it can be said with positiveness that the evidence shows that after the age of 45 years such craftsmen are under no handicap in competition with younger workers. . . . The indications in our data that the preferences for younger people come mainly from the large plants where unskilled and semi-skilled labor predominates are supported by studies made in other parts of the country."

The group represented by the census data above cited on ages of automobile factory employees would therefore reflect the *least* favorable picture of the industry in regard to employment of older workers.

Although the automobile manufacturing industry increased its employment of unskilled and semi-skilled men over 45 years of age by 51.3 per cent during the decade 1920-30 as compared with an increase in employment of men of all ages in the industry of only 39.0 per cent, the picture needs further clarification.

It has long been recognized that old, stable or shrinking industries tend to have a larger number of older employees than do new and rapidly expanding industries. An analysis of the relationship between the rate of growth in total employment of semi-skilled and unskilled men and the change in the proportion of these men over 45 years of age in the 60-odd manufacturing industries reported by the census shows a high degree of correlation between the growth rate and the change in the proportion of older men during the decade. This is vividly illustrated by the tabulation on page 176, which compares

Table 2

Unskilled and Semi-skilled Gainfully Employed Males* in All Manufacturing and Mechanical Industries

Age Group	1920	1930	% Increase
Total all ages	5,064,278	5,539,020	9.4
Under 25 yrs.	1,390,108	1,440,037	3.6
25 to 44 yrs.	2,405,465	2,581,806	7.3
45 and over	1,255,397	1,510,026	20.3
Unknown	13,308	7,151	...
Change in *proportion* of men 45 and over			10.0

*Includes only those operatives not elsewhere classified by occupations in the Census reports.

Table 3

Unskilled and Semi-skilled Gainfully Employed Males in Automobile Factories

Age Group	1920	1930	% Increase
Total all ages	189,250	263,075	39.0
Under 25 years	51,758	59,022	14.0
25 to 44 years	102,623	151,654	47.8
45 and over	34,537	52,250	51.3
Unknown	332	149	...
Increase in *proportion* of employees 45 and over			8.8

Table 4

Manufacturing Industries

Unskilled and Semi-skilled Male Change in Total Employment vs. Change in Proportion 45 Years Old and Over, 1920-1930

Industry	Increase or Decrease in Employment of Men of All Ages	Increase or Decrease in Employment of Men of 45 and Over	Change in the Proportion of Men 45 and Over
1. Electrical Supply Factories	72.7%	44.9%	—13.2%
2. Petroleum Refineries	64.4	45.6	—11.4
3. Gas Works	52.3	56.6	2.8
4. Marble and Stone Yards	52.3	43.8	— 5.6
5. Knitting Mills	49.4	— 3.2	—35.2
6. Bakeries	48.7	21.2	—18.5
7. Fruit and Vegetable Canning, Etc.	48.0	29.9	—12.2
8. Paint and Varnish Factories	41.9	35.2	— 4.7
9. Automobile Factories	**39.0**	**51.3**	**8.8**
10. Fertilizer Factories	38.7	12.9	—18.6
11. Lime, Cement and Artificial Stone	32.8	39.9	5.3
12. Furniture Factories	28.2	26.0	— 1.7
13. Carpet Mills	26.5	22.7	— 3.0
14. Butter, Cheese and Condensed Milk	25.0	16.5	— 6.8
15. Printing, Publishing and Engraving	23.5	33.7	8.3
16. Blank Book, Envelope, Tag, Etc.	23.1	17.2	— 4.8
17. Brick, Tile and Terra-Cotta Factories	22.4	27.0	3.8
18. Hat Factories (Felt)	21.9	19.5	— 2.0
19. Tinware, Enamelware, Etc., Factories	21.6	18.9	— 2.2
20. Silk Mills	21.3	26.9	4.6
21. Potteries	16.5	35.2	16.1
22. Sail, Awning and Tent Factories	16.3	— 1.1	—15.0
23. Paper and Pulp Mills	9.1	14.2	4.7
24. Soap Factories	5.1	10.1	4.8
25. Saw and Planing Mills	3.3	11.8	8.2
26. Agricultural Implement Factories	3.2	— 2.7	— 5.7
27. Shirt, Collar and Cuff Factories	2.9	5.5	2.5
28. Blast Furnaces	— 2.3	17.6	20.4
29. Shoe Factories	— 3.4	12.6	16.6
30. Textile Dyeing, Finishing, Etc., Mills	— 3.8	— 3.8	0.0
31. Cotton Mills	— 4.2	3.2	7.7
32. Glass Factories	— 6.5	3.7	10.9
33. Lead and Zinc Factories	—10.1	5.1	16.9
34. Flour and Grain Mills	—13.1	0.5	15.7
35. Fish Curing and Packing	—13.8	—24.0	15.7
36. Candy Factories	—15.1	5.4	24.1
37. Slaughter and Packing Houses	—15.3	— 5.2	11.9
38. Brass Mills	—16.6	5.7	26.7
39. Paper Box Factories	—18.2	—11.7	7.9
40. Leather Belt, Case, Etc., Factories	—20.5	— 4.4	20.3
41. Clock and Watch Factories	—20.6	—16.6	5.0
42. Jewelry Factories	—20.7	— 6.4	18.0
43. Broom and Brush Factories	—20.9	—15.5	6.8
44. Copper Factories	—21.6	—13.3	10.6
45. Woolen and Worsted Mills	—21.9	— 0.9	26.9
46. Gold and Silver Factories	—23.4	— 2.9	26.8
47. Tanneries	—24.6	— 6.5	24.0
48. Corset Factories	—24.8	—12.2	16.8
49. Rubber Factories	—25.6	— 4.8	28.0
50. Liquor and Beverage Industries	—25.9	—35.9	—13.5
51. Glove Factories	—26.4	—10.2	22.0
52. Trunk Factories	—28.9	— 5.3	33.2
53. Lace and Embroidery Mills	—31.0	15.2	67.0
54. Hemp, Jute and Linen Mills	—31.5	—29.8	2.5
55. Car and Railroad Shops	—32.1	—11.9	29.7
56. Rope and Cordage Factories	—33.1	—21.4	17.5
57. Sugar Factories & Refineries	—34.8	—19.1	24.1
58. Suit, Coat and Overall Factories	—35.5	— 8.5	41.9
59. Explosives, Ammunitions, Etc., Factories	—38.5	—34.7	6.2
60. Button Factories	—38.7	— 9.6	47.5
61. Cigar and Tobacco Factories	—39.6	—30.5	15.1
62. Charcoal & Coke Works	—42.6	—38.1	7.8
63. Piano and Organ Factories	—57.8	—37.1	49.1
64. Harness and Saddle Industries	—61.9	—49.4	32.8
65. Ship and Boat Building	—77.6	—65.2	55.4
66. Wagon and Carriage Factories	—78.6	—75.2	15.9
67. Straw Factories	—91.3	—86.1	59.8

Census of Occupation: Male laborers and operatives only. All manufacturing and mechanical industries, except "not elsewhere classified," and building industries.

by industries the percentage increase or decrease in total employment of unskilled and semi-skilled men with the percentage 45 years old and older and the percentage change in the proportion of those men who were 45 years of age or over in 1930 as compared with 1920. (See Table 4.)

Although the existence of a close relation between growth rates and change in the proportion of older men is obvious from this table, it will be defined even more closely by grouping the industries according to the change shown in employment and computing averages for these groups. (See Table 5.)

Table 5 clearly shows that in general: (1) The greater the rate of expansion in total employment, the greater was the proportion of younger workers brought into the industry. Conversely, the greater the shrinkage in total employment the more pronounced was the tendency to retain the older workmen and dispense with the younger ones. (2) The automobile industry increased its proportion of older employees while other industries with similar rates of growth, on the average, show a substantial decrease in the proportion of men of 45 and over.

Using the group average shown in the table as defining the normal functional relation between growth rate and change in proportion of older men, it appears, by interpolation, that the normal expectation for an industry such as automobile manufacturing which shows a 39 per cent increase in total employment would be for its proportion of men of 45 and over to *decrease* 7.1 per cent.

Actually, automobile factories *increased* their proportion of older men 8.8 per cent. In other words, the industry employed 17.6 per cent more men of 45 and over in 1930 relative to 1920 than would have been normally expected from its rate of growth.

Stated another way, with an increase of employment at all ages of 39 per cent, the normal expectation for employment of men of 45 or more in the automobile industry is an increase of 28.5 per cent. The actual increase in employment of older men was 51.3 per cent. The industry increased its employment of men of 45 and over by *80 per cent more than would be expected on the basis of the average performance of American manufacturing industries.*

It cannot arbitrarily be assumed that any pre-depression normal in regard to employment continued to rule during the last four years. Therefore, it is necessary to carry forward this analysis on the basis of available post-1930 reports.

While no data regarding the changes that took place between 1930 and the present time can be obtained from census reports, additional data have been obtained from certain automobile manufacturing companies covering the years since 1930.

Table 6

One Company's Record

Age Group	1930	1934	% Change
Total all ages	26,924	59,796	122.1
Under 30 years	9,173	21,163	130.7
30 to 39 years	9,590	22,377	133.3
40 years and over	8,161	16,256	99.2
Change in proportion of men of 40 and over			—10.4

Table 5

Industry Groups

Change in Total Employment vs. Change in Proportion 45 Years Old and Over, 1920-1930

Industries Grouped by Change in Total Employment	Average Change in Employment of Men of all Ages	Average Change in Employment of Men 45 and Over	Average Change in Proportion of Men of 45 and Over**
Increased 60%—79%	68.6%	47.8%	—12.3%
" 40—59	48.8	30.6	—12.2
Automobile Factories	**39.0**	**51.3**	**8.8**
Increased 20—39*	27.0	26.0	— 0.7
" 0—19	8.1	10.4	2.2
Decreased 0—19	—10.2	0.8	14.5
" 20—39	—28.2	—13.0	21.7
" 40—59	—50.2	—37.6	28.5
" 60—79	—72.7	—63.3	34.7
" 80—99	—91.3	—86.1	59.8

**Average of individual industry per cent changes.
*Including automobiles.

The following analysis of changes that occurred in the age distribution of employees in certain automobile manufacturing companies between 1930 and 1934 includes two of the three largest manufacturers in the industry, as well as five of the smaller companies and may be considered representative of all companies in the industry.

In one company in which the total employment increased 122.1 per cent between 1930 and 1934 there was an increase of 99.2 per cent in the number of workers 40 years of age and over.

The age distribution of this company's employees in each of these years and the percentage change in each age group is shown in Table 6.

In five companies whose aggregate employment in 1934 was at practically the same level as in 1930 the distributions by age groups in the two years are shown in Table 7.

A third comparison of the age distribution of employees in an automobile company, also is presented. In this case the employment of workers in all age groups in 1934 was only 58.2 per cent of what it was in 1930. (See Table 8.)

It should be noted that the trends disclosed in the above tables conform to the general findings from the census reports regarding the effects of expansion and contraction of employment in an industry on the proportion of older workers.

Still further light is shed on the comparative status of older workers in a survey made of 14 important automobile plants employing in total more than 75,000 factory workers during the production year (from September, 1933—August, 1934). From this study it is possible to obtain pertinent data for workmen classified according to amount of employment which they received during the year. The table below shows the average amount of work given to all men in each five-year age bracket from 16 to over 60. (See Table 9.)

It is apparent that the older employees have been the beneficiaries of much steadier employment than the younger men in these plants. This same analysis, when extended to annual earnings, shows even a larger bias in favor of the older men.

Summarizing the Table 9, it appears that men of 50 and more received on the average 49 per cent more work and 64 per cent more pay during the year than did men of less than 30 years.

Table 7

The Record for 5 Companies

Age Group	1930	1934	% Change
Total all ages	15,456	15,505	0.3
Under 30 years	5,348	4,090	—23.5
30 to 39 years	4,956	5,260	6.1
40 years and over	5,152	6,155	19.5
Change in **proportion** of men of 40 and over			19.1

Table 8

Older Workers Decrease Less

Age Group	1930	1934	% Change
Total all ages	90,731	52,791	—41.8
Under 30 years	22,754	11,310	—50.3
30 to 39 years	34,867	18,368	—47.3
40 years and over	33,110	23,113	—30.2
Change in **proportion** of men of 40 and over			20.0

Table 9

Average Annual Individual Hours of Work and Pay by Age of Employee Relative to Average Hours and Pay for Male Employees of all Ages

**Fourteen Automobile Manufacturing Plants
September 1933—August 1934**

Average of all ages = 100 per cent)

Age Group	Index of Individual Annual Hrs.	Age Group	Index of Individual Annual Earnings
16-19	71.6%	16-19	58.0%
20-24	78.1	20-24	70.3
25-29	97.1	25-29	94.6
30-34	105.2	30-34	107.9
35-39	105.1	35-39	108.9
40-44	110.6	40-44	116.0
45-49	116.9	45-49	122.6
50-54	127.2	50-54	133.0
55-59	138.1	55-59	143.1
60 and over	141.1	60 and over	141.1
All ages	100.0	All ages	100.0

A New Positive

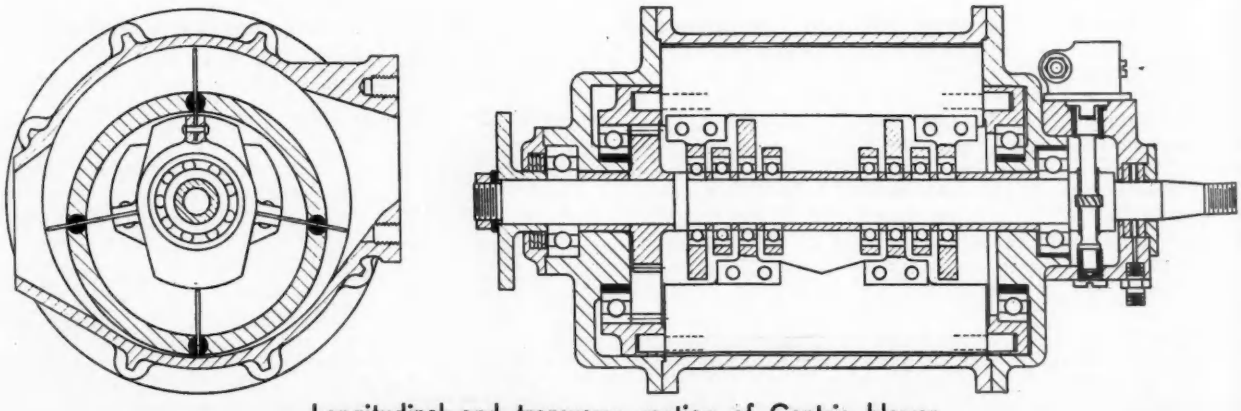
IF the average designer were asked what he has against supercharging, he would almost certainly reply, "the supercharger," adding that, until this device has been developed sufficiently far to afford a reliability equal to that of other engine accessories and can be made at a reasonable production cost, it is best left alone. He is quite ready to believe that supercharging will give a handsome return in increased power output, but only at a high price in fuel consumption.

It will be of interest, therefore, to examine the design of the "Centric" supercharger, which has been developed in Preston, England, because this does seem definitely to overcome the first objection, without introducing anything likely to put up the cost of production. This supercharger is of the positive, rotary vane type, which is, incidentally, the only type which is still in use in England on road vehicles. The reason for this is, of course, its satisfactory output at low speeds as well as high, while the centrifugal blower is best suited to constant-speed engines. The Roots type has the rather serious objection of being extremely noisy in operation.

The special feature which makes the Centric design of interest is the method of locating and driving the blades within the casing. Each of the four blades is separately hinged on a central spindle by means of ball bearings. The blades rotate at speeds up to 5000 r.p.m., but, as each is counterweighted, the ball bearings have very little to do, and an exceedingly fine clearance can be maintained between the blade tips and the casing, so that the volumetric efficiency is well maintained at low running speeds. At the same time, there can be no risk of actual contact. The arrangement of the blades is shown in the accompanying drawing.

Advantage is taken of the central spindle to provide a through drive which is concentric with the outer casing, so that the supercharger may be used to drive other auxiliaries in tandem, or may be used in pairs where space is limited. This central shaft is arranged to rotate in the same direction as the blades, thus further re-

THE author of this article is a designer of Diesel engines and looks at the supercharger problem chiefly from the point of view of application to that type of engine. His statement that the positive-displacement blower is the only one still in use in England on road vehicles calls for some comment. In England superchargers are used only on small cars which are underpowered to save on the tax. The engines having a very small displacement, they are shy on power throughout the speed range, and it is therefore desirable that the supercharger boost the power throughout the speed range—provided the engines can stand it. This is equally desirable for boosting Diesel engines for use on trucks or for other applications where operation throughout a wide speed range is required, with the same proviso. On American passenger cars superchargers are used mainly to give the cars a high rate of acceleration at comparatively high speeds, to facilitate overtaking of cars traveling at the normal touring speed. For this purpose, the centrifugal supercharger has definite advantages, because it gives an appreciable boost only at the higher speeds. A supercharger which boosts the output substantially uniformly throughout the speed range could be too easily abused. The compression ratios of these engines are usually so high that the engines operate close to the detonating limit at low speeds without supercharging, and if the charge were boosted materially, the engines certainly would knock badly at low speeds.—EDITOR



Longitudinal and transverse section of Centric blower

Displacement Supercharger

Reliability and reasonable production cost claimed for "Centric" rotary vane design

by P. E. Biggar

ducing the work thrown on the hinge bearings.

The second point of interest is the method used to drive the blades against the air pressure, through the displacement drum, necessarily mounted eccentric to the casing and spindle. The drum, which is mounted in its own ball bearings, drives the blades through trunnion blocks and is in turn driven from the central spindle through a pair of internal and external gears. This arrangement has the advantage of affording a through drive concentric with the casing, but reduces the effective running speed to two-thirds that of the driving speed. The trunnion blocks, which are slotted, cylindrical rods of Fabroil, drive the blades, permitting a limited amount of rocking or wobble, and seal the working space off from the central compartment. They are the only part of the supercharger ever likely to wear out, and are cheap and easy to replace.

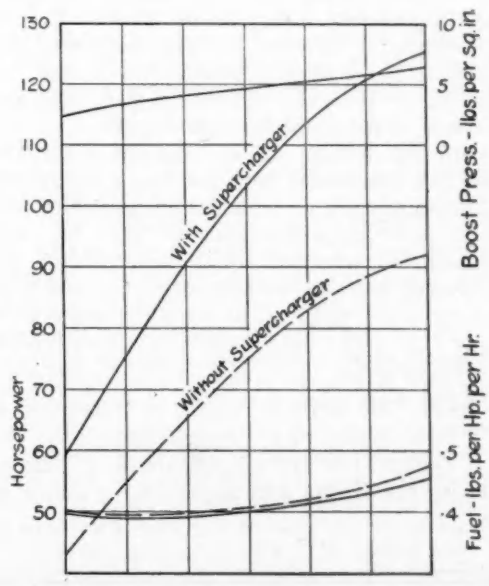
Apart from these special features, this supercharger is similar in design to others of the vane type. The casing is of aluminum alloy, the rotor of Y-alloy, the blade carriers of die-cast aluminum, and the blades, shaft and gears of nickel steel. The lubricating oil supply, which may be taken from a separate tank or from the engine crankcase, is fed through a small metering pump, driven at one-quarter of the supercharger speed. The oil is fed through the hollow central spindle to all of the ball bearings, and is centrifuged out to the trunnion blocks. The rate of flow is set to give a consumption of about 2000 miles per gallon in average service.

The weight of the medium-size supercharger, suitable for use on engines of 250- cu. in. displacement, is 41 lb. The maximum pressure recommended is 24 lb. per sq. in., or, alternatively, as an exhauster, a vacuum of 24 in. of mercury. The recommended maximum speed of this supercharger is 5000 r.p.m.

It will be of interest to give an example of the results obtained with this supercharger. Fig. 2 shows performance curves for an oil engine of 500 cu. in. displacement before and after fitting with two superchargers of the type described. It will be seen that the power output is substantially improved throughout the speed range, the maximum power being increased by 33 per cent, while the fuel consumption is slightly improved, in spite of the work done in driving the supercharger. The measured volumetric efficiency (N.T.P.) over the speed range shown was found to vary from 72 to 77 per cent. The cost of the engine per useful maximum horsepower was reduced by 15 per cent and the weight on the same basis was reduced by 22 per cent by fitting the supercharger.

In considering these figures, it must be borne in mind that, unless the engine to be supercharged has a sufficiently wide margin in bearing areas, water cooling and lubricating oil cooling, trouble will almost certainly be met with on account of the higher maximum pressures and considerably increased rate of heat flow. In this case the supercharger is best regarded as a useful method of hunting out the weak spots rapidly and effectively.

If, however, the engine has something in hand in these various departments, there is a very real gain to be had by supercharging, especially in the case of oil engines of the direct-injection type, in which the additional power can be obtained without any increase in specific fuel consumption. In the example already cited, it proved possible to use a comparatively cheap, quantity-produced engine in a heavy truck which would normally have required a larger, heavier and more expensive engine to give it a satisfactory road performance. No mention has been made of the use of this supercharger in connection with two-stroke oil engines, although this will undoubtedly prove an important application when further development has taken place.



Power curves and fuel consumption curves of 500 cu. in. Diesel engine with and without supercharger

JUST AMONG OURSELVES

It All Depends on The Assumptions

MOTOR vehicle operators are estimated to have received a government subsidy of $594,687,100 in 1932 and in the 1921-1932 period of $7,119,794,000. These are the amounts by which it is charged highway users failed to pay their way. It seems hardly necessary to mention that the estimates were made by the railroads.

The whole trick lies in the assumptions used in determining what proporton of the total bill for highways and city streets should be paid by motorists. The railroads assumed that the per capita value of the social and community service rendered by highways was no greater in 1932 than in 1904, so after adjusting for changes in the price level they arrive at the conclusion that only 18 per cent of total highway costs should be paid out of general taxation. In the case of city streets, social and community service value is put at 75 per cent.

With adjustments made for size and weight in accordance with railroad theories on this subject, the effect of the application of these assumptions to taxation would be to increase the average taxes paid by passenger cars by $12.87 to a total of $37.74, while the levy on truck trains of over 5 tons would be increased an average of $1,310 to $2,012 annually, with other sizes of vehicles in between.

* * *

The Fight Must Go On

THIS week the "share the wealth" tax bill will be voted on by the House and apparently it is going to be passed in some form or other. Nevertheless, business should fight its passage relentlessly, and if it is enacted should work ceaselessly for repeal of those features of it that have yet to be proven sound.

In the House bill it is expected that the taxes on corporate income will be graduated only from 13¼ to 14¼ per cent instead of the 10¾ to 16¾ per cent range proposed by the President and the flat 13¾ per cent levied by the present law. The 1 per cent range of graduation in the tax proposed by the House indicates that Congress is far from sold on the idea and apparently is including the graduated levy so that it won't be in the position of turning the President down entirely.

Although the graduated rates can't mean an increase or decrease in taxes for any corporation of more than ½ per cent, they should not be accepted supinely just because they don't hurt much. Until it is proved with facts, the theory that it is in the public interest to discourage bigness should be opposed bitterly as unsound. About the only argument in its favor that has been advanced so far is that some politicians think it will get votes.

There is, of course, no dodging the fact that the bills of government must be paid, and the bigger the bills the bigger the taxes needed to pay them. But that does not justify the use of the taxing power to apply an economic theory that seems to be grounded mostly in political expediency.

* * *

The Federal Government will share more wealth by encouraging business volume than by discouraging business profits.

* * *

Standardized Lubrication

THE effort that is being made through the use of the S.A.E. motor vehicle lubrication data form to secure uniform information on the lubrication requirements of automobiles merits the enthusiastic backing of the entire industry. Filling out the form will require considerable work on the part of the vehicle makers, but in view of the fact that lubrication is the maintenance service most frequently needed, the cost will be a good investment since it will promote the use of the right lubricant at the right place.

* * *

Unbumpy and Bumpy Fuels

THE Swedish person who, when his doorbell ceased to function, hung a sign on it reading, "Bell bane don't button—bump," suggests to H. H. Maxfield of the Shell Motor Laboratory a possible answer to our recent items on the need for a word to supplant anti-knock.

Mr. Maxfield says: "As that sign eliminated 'knock,' so too could 'bump' take the place of 'anti-knock.'" In comparisons, he suggests bumpy, bumpier and bumpiest, and for fuels having a high octane rating "unbumpy." However, Mr. Maxfield believes octane number describes this fuel characteristic quite sufficiently, both for the expert and the inexpert, even though the latter may not know what it means exactly.

For a quantitative expression, we agree with Mr. Maxfield entirely, but we still feel that for qualitative purposes something simpler than a fuel "with a high octane number" or "a higher octane" fuel might be helpful.

—D. B.

AUTOMOTIVE ABSTRACTS

Resistance of Spring Steel to Repeated Impact Stresses

THE irregular decarburized surface which is present on a normal heat-treated spring plate produces a low repeated-impact endurance limit (10^6 impacts) in the same manner as it produces a low endurance-fatigue limit. The irregular decarburized surface on a spring steel does not appear to have any adverse effect on the resistance to a large impact of magnitude approaching the full single-blow impact strength of the plate. The graphite heat treatment, which has been shown to give a high endurance-fatigue limit for spring steels, may also be useful for improved resistance to repeated impact. Stanton and Bairstow's conclusions for notched test-pieces apply to both machined and unmachined spring steels in that the behavior under a very small number of impacts is indicated by the result of a single-blow test, but that repeated-impact endurance limits correspond to the results of cyclic-fatigue endurance tests.

The foregoing conclusions are drawn from experimental work done in the Engineering Department of the National Physical Laboratory on which a report was made to the Iron and Steel Institute by G. A. Hankins and H. R. Mills. The report is reprinted in abridged form in *Engineering* of June 7.

* * *

Hitler Puts Copper and Nickel on "Verboten" List

UNDER an edict covering the use of non-precious metals, German automobile manufacturers are forbidden to use copper, nickel and their alloys for door handles, crank handles, pull rods with knobs, storm rods for cabriolets, door hinges, door dovetails, striker plates, hood locks, hood handles, radiator ornaments, radiator caps, trunk mountings, trunk hinges, body moldings, ornamental fittings, robe rails, foot rests, hand grips, protective devices for doors and windows, horns, ventilators, baggage nets, window buffers, flag poles, wheel and hub caps, wheel and hub disks, radiator shells, radiator guards, tire carriers, tire covers, nuts for rim bolts, rim tools, air cleaners, fuel tanks, tank caps, lamp housings, fittings for interior lamps and rear-view mirrors.

The prohibition further covers fittings with the exception of those carrying electric currents, all kinds of locks, pins and nails, reflector housings, lamps and lighting units for motorcycles and bicycles (except the reflectors), oil cans and bells for bicycles.

No more than 12 per cent tin can be used in bearing bushings. The so-called supplementary alloys for galvanizing baths are prohibited. Of the greatest importance to the automobile industry is a prohibition of ornamental protective coatings of chromium, nickel and cobalt.

The above restrictions on the use of imported metals do not apply where it can be shown conclusively that goods are being produced for export. It is therefore expected that these regulations will not affect German automobile exports. Of course, most of the body parts enumerated above are generally made of steel anyhow.

A special issue of the *Automobiltechnische Zeitschrift* is devoted to the new problems which confront German automobile designers as a result of these regulations.—*ATZ*, June 25, 1935.

* * *

Tractors in England

AGRICULTURAL conditions in the United Kingdom are "on the mend," and the market for power-operated (and other) agricultural machinery therefore is improving. In a recent issue of *Farm and Machine*, published by the Institute for Research in Agricultural Engineering at Oxford University, a list of 56 types of farm tractors is listed as having been tested in Great Britain. Evidently the Oxford Institute does for Great Britain what the University of Nebraska does for the United States. One of the features of this list is the almost complete disappearance of the gasoline tractor for ordinary field work. One of the most marked developments is the extension in the use of the light two-wheeled tractor for market-gardening and also in general farming.

A number of entirely new machines were shown at the Royal Agricultural Show, which opened at Newcastle-upon-Tyne on July 2. Although the progress made with the application of Diesel engines to ordinary tractors has been somewhat disappointing in Great Britain, many examples of such power units were to be seen at the show in the heavier machines designed mainly for export, and on auxiliary plants such as lighting sets. J. & H. McLaren, Ltd., exhibited examples of their Diesel-engined hoists, together with marine engines and lighting set. Stanhay, Ltd., of Ashford, Kent, exhibited the C. G. L. cultivator for use on small farms and particularly for beet crops. This cultivator is powered by a 1½-hp. Villiers two-stroke, single-cylinder, air-cooled engine and has a completely enclosed transmission gear. The same firm exhibited a Fordson tractor fitted with a special short-turning base for hop and fruit work, and also with special 7-in. potato wheels which can be supplied to track any width of row. The new Allis-Chalmers WC farm tractor was also shown.—*Engineering* of July 5.

* * *

Tercentenary of Robert Hooke

ON July 18 occurred the tercentenary of the birth of Robert Hooke, one of the greatest of experimental philosophers and one whose name is known to every engineer as the discoverer of the fundamental law that stress is proportional to strain in elastic materials. When he made this discovery, Hooke was only 25 years of age, but he was a constant attendant at that "experimental philosophical clubbe" at Oxford, which was the forerunner of the Royal Society. Having received a sound classical education, he became chorister and servitor at Christ Church, Oxford. He spent eight years at the university, and this period provided him with many opportunities to follow his favorite studies in mechanics. To this period also belong some of his most important inventions and researches. In

1662 he was appointed curator of the Royal Society. In 1664 he was made Cutlerian lecturer on mechanics, and in 1665 he became professor of geometry in Gresham College. That same year saw the publication of his "Micrographia, or some Physiological Description of Minute Bodies made by Magnifying Glasses, with Observations and Inquiries Thereupon." In 1674 he published his "Attempt to Prove the Motion of the Earth"; in 1676, "Description of Helioscopes," and in 1679 "Cometa." He died in 1703 at the age of 68.—*Engineering*, July 12.

Fluid Flywheels and Hydro-Kinetic Transmissions

A HISTORY of the development of fluid couplings and hydro-kinetic transmissions in Europe was given in a paper read before the Institution of Mechanical Engineers of England by Harold Sinclair, director of the Hydraulic Coupling and Engineering Co., who has been personally responsible for a good deal of this development. This type of hydraulic mechanism is based on work carried out by Dr. Foettinger, who previous to the war was connected with the Vulcan shipyards of Stettin and Hamburg, Germany. This work followed the introduction of steam turbines in ship propulsion, for which there was at first no suitable speed reducer. Dr. Foettinger conceived the idea of a hydraulic speed and torque transformer comprising a centrifugal pump combined in a single unit with a turbine runner, giving a speed reduction of the order of 5:1, which would enable both the steam turbine and the ship propeller to operate at speeds conducive to high economy. The hydraulic losses amounted to 15 per cent, but this loss was more than made up by the better operating conditions of turbine and propeller. These hydraulic marine transmissions were made in units of 10,000 and 15,000 hp., and for a time enjoyed considerable popularity, but when Sir Charles Parsons introduced helical reduction gearing it soon superseded hydraulic transmissions for steam turbines.

A somewhat later development in marine practice was the use of high-speed Diesel engines. It had been found in the meantime that the greater part of the loss in the hydraulic transmission was due to the presence of the intermediate stationary member, without which there could be no increase in torque, and that if this stationary member were eliminated a hydraulic coupling was produced which might have an efficiency as high as 98 per cent. The early high-speed Diesel marine engine when direct-coupled to a propeller through a long line of shafting gave a great deal of trouble from torsional vibration, and the Vulcan hydraulic coupling, acting as a damping device, was found to eliminate such vibration. In such a coupling the torque output is equal to the torque input, while the per cent efficiency is equal to 100 minus the per cent of slip. The Vulcan type fluid coupling was also built in combination with reduction gearing and was then known as the Vulcan gear.

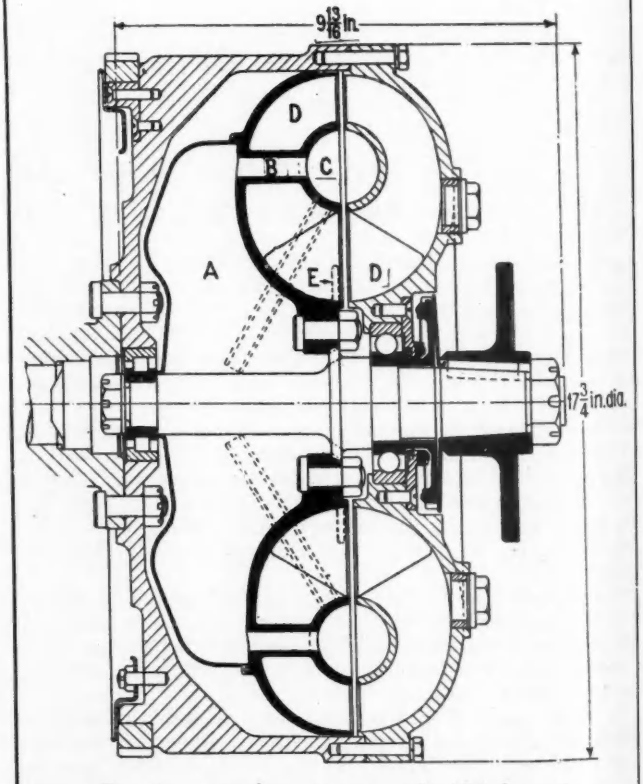
The development of the "fluid flywheel" arose directly from the shortcomings of the friction clutches of the London Type K omnibus of 1926. Mr. Sinclair at that time was studying the application of hydraulic couplings to winches, and on numerous bus journeys it became evident to him that there must be a field for the uniquely smooth drive obtained from the hydraulic coupling in bus work in congested cities like London. It was found, however, that the requirements were rather conflicting, in that in order to obtain a high working efficiency the slip must be small, which calls for a large profile of the working circuit, while in order to prevent creeping of the vehicle with the engine idling the slip must be high, which calls for a small profile of the working circuit. A compromise was made by selecting an intermediate size. It was also found that the coupling must not be filled with oil to more than 0.9 capacity, to allow room for expansion due to heating (in the early days burst flywheels were not exceptional). But if the air expansion space is large enough to be really effective, the slip becomes too high, owing to churning of the air and oil; hence the filling plug must be situated at a point which permits just sufficient expansion space for ordinary conditions of working.

This difficulty was overcome in a simple way in the traction coupling, shown in section herewith, by the provision of a reservoir chamber back of the runner or driven part. The reservoir chamber A is connected with the working circuit by a number of tubes, B, extending into the center of the vortex ring, C, to permit of interchange of liquid from the working circuit, D, to the reservoir and vice versa. The reservoir chamber removes part of the oil from the working circuit under starting conditions, thereby reducing the drag torque or creeping tendency; it returns oil to the working circuit when the normal speed is approached, thereby reducing the slip to a very low value at normal road speeds; it acts as an expansion chamber, keeping the pressure rise in the working circuit low, and it separates air from the oil so that the working circuit is kept charged with air-free oil by centrifugal force.

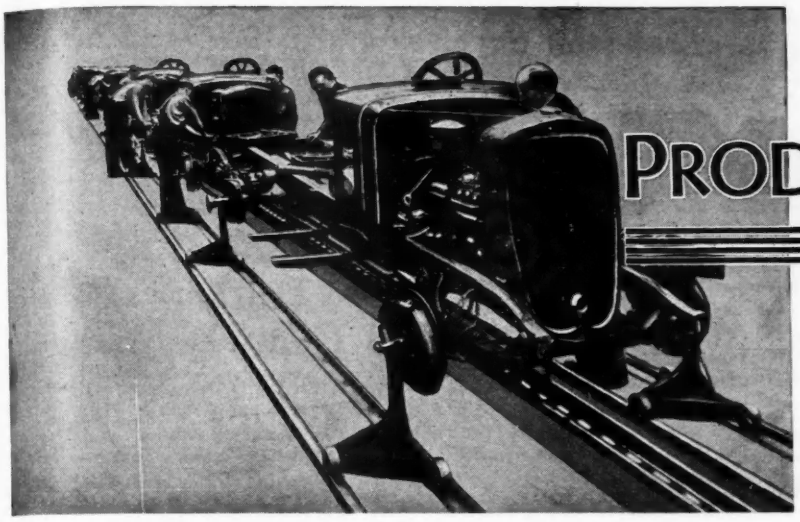
At first the fluid flywheel was used in combination with a standard sliding-gear transmission, and this necessitated the provision of a cone clutch in order to be able to make gear changes. The retention of the friction clutch was considered undesirable, and continued attempts were made to render it unnecessary. At first a ring valve was used in conjunction with a clutch brake to quickly stop the runner when the clutch pedal was pressed down, but this was found to be insufficiently effective.

During the early months of 1930 the influence of the Wilson epicyclic gear was becoming felt in the automoble industry on account of its quiet running in all gears. A year or two previously articles had appeared in the German technical press concerning the combination of a hydrokinetic gear with a planetary gear. The development was due to

(Turn to page 186, please)



Traction coupling to transmit 130 hp. at 3400 r.p.m.



PRODUCTION LINES

Veto Waste

Westinghouse carries on with its campaign against waste in industry. A very comprehensive report of its current activity is found in a paper read at the recent A.S.M.E. meeting in Cincinnati. The paper is far too lengthy and much too important to abstract here, so we suggest a reading of it in its original form. Westinghouse has some extra copies available. Ask for "Salvaging and Reclaiming Items in Every-Day Use" by T. H. Owens of W. E. & Mfg. Co.

Turn-Milling

Little has been said publicly about the new process of metal cutting-turn-milling. Its chief claim to real greatness is the use of climb-milling in which the work is held freely between two diametrically opposed cutters. An interesting application has been in use in Detroit for some time; a new job has been adopted by one of the parts people and should be in use within the month.

No Adjustment

There is a valve tappet design, far in the offing at the moment, which requires no adjustment and by virtue of this fact it can be built in so as to be inaccessible in service. Eventually, it may be possible to build an engine of simple design incorporating concealed tappets.

Air Conditioning

One of the parts makers is working on an air-conditioning unit for passenger cars. It draws air from the hood ventilator through a water tank. A fan blows moistened air into the passenger compartment. Probably will be sold as a replacement unit.

Work Safety

Analysis of 150 accidents picked at random shows that a total of 22 per cent occurred when the operator was not regularly employed on the machine. An additional 11 per cent occurred when the man was a regular operator, but had been working one month or less. This observation from the National Safety Council should be of timely interest to foremen and all those concerned with personnel work.

Drafting Code

Many years of labor went into the Drafting Practice Code which has been published by the American Standards Association. The next step lies in its adoption by industry. Those who are concerned with drafting room management in the automotive industry will find it profitable to study the code and weigh it against present practice. Out of a cooperative movement will come the most good to everyone concerned.

Flivver Plane

There seems to be quite a bit of discussion brewing on the matter of the $700 plane. Some of the airplane builders still feel that a practical ship at the price is nowhere in sight. One way out lies in the feasibility of using a passenger car power plant. If the standard engine demonstrates the requisite performance and dependability, it may offer the solution, since the cost of a production engine is but a fraction of the cost of an aircraft engine as built in relatively small quantities. Still the battle goes on.

Tell Us

Now and again we get the rumor that someone is about to bring out an electric that would sell at a low price and displace gas cars. If the claims made for the vehicle were not so amazing, people would be inclined to take it more seriously. For instance, it is claimed that a new storage battery has been developed with sufficient power packed into 200 lb. of battery and filler to drive the car. Also that the cost of current is only 10 cents per thousand miles. Do any of you know anything about this alleged development? We should like to investigate.

Body Lines

Indications are that no great changes are expected this season by way of body styling. More turret tops of course. But we haven't heard about any shift to ideal streamlines.

Cast Grille

Die cast radiator grilles may be somewhat more popular next season. At least one other car maker is said to be planning the use of a zinc die casting.

—J. G.

MANUFACTURING MANAGEMENT METALLURGY

Ford Starts Erection of Two New Coke Ovens

Excavation has been begun at the Rouge Plant of the Ford Motor Company at Dearborn, Mich., for two new batteries of coke ovens which, when completed, will provide 8,000,000 cu. ft. more gas per day for plant operations than is now available from Rouge sources.

The excavation marks the first step in a project which will cost $4,000,000. Foundations for the two batteries, each comprising 61 ovens, will be laid before winter, and the ovens will be ready to produce by next summer.

The new batteries will replace a portion of old coke-making equipment and will extend southward for more than 500 ft. from the end of a present 60-oven battery.

Under the present coke and gas-making schedule, 4800 tons of coal were used daily to produce 33,600,000 cu. ft. of gas for use in other portions of the Rouge plant and 24,000,000 for use at the coke ovens.

The new program contemplates the use of only 3800 tons of coal to produce 41,600,000 cu. ft. of gas for operations elsewhere in the plant, and 4,000,000 for use at the ovens. This is made possible by the fact that the new ovens are so constructed that they can utilize blast furnace gas for heating purposes. Older ovens at the Rouge all utilize a percentage of their own gas output to heat their coal charges. All the gas output of the two new batteries of ovens, which will total 36,000,000 cu. ft. a day at capacity, may be used for operations elsewhere in the Rouge.

From the 3800 tons of coal which will be charged in the new ovens and those of the old ones which will continue in use, 2850 tons of coke will be procured, a decrease of 750 tons a day from the 3600 tons of coke procured from 4800 tons of coal, under the previous program.

Electric Auto-Lite

Electric Auto-Lite earned $1,342,688 or $1.01 a share after all charges and preferred dividends in first half 1935, compared with $727,448 for like period last year, net working capital, $9,261,951, showing gain of $2,740,883 in six months.

Evans Building 150 M.P.H. Motor Boat

A new type of boat, known as a hydrofoil, said to be capable of doing 150 miles an hour with one-fourth the power used in Gar Wood's Miss America X; which holds the record of 124.86 miles per hour, has been developed by E. S. Evans, president of Evans Products Co. and his two sons, Bob and Ed. It will be launched on the Detroit River in about six weeks.

The boat, which is a development of Alexander Graham Bell's principles, has a hull modeled after an airplane fuselage mounted with outriggers to which are attached submerged wings or steps. It will have only two square feet of planing surface at high speed as compared with 200 square feet of drag in the world record holder. It is powered with a 650 horsepower Packard motor, but the hull is constructed for an 1800 horsepower engine which is expected to produce easily 200 miles per hour.

Evans said the boat will participate in the next Harmsworth race, but his first objective is the breaking of all existing motorboat speed records.

GM Sales for Seven Months 1934-1935

	July, 1935	June, 1935	July, 1934	Seven Mos., 1935	Seven Mos., 1934
Sales to world dealers	167,790	181,188	134,324	1,056,350	884,600
Sales to U. S. dealers	139,021	150,863	107,554	849,245	700,421
Sales to U. S. consumers	108,645	137,782	101,243	757,480	596,215
Change in U. S. dealer stocks	+30,376	+13,081	+6,311	+91,765	+104,206
Sales to foreign dealers	28,769	30,325	26,770	207,105	184,179

APEM Man-Hours Gain 18.4 Per Cent

During the first four months of 1935, the automotive parts and equipment manufacturing industry showed a gain over the same period of 1934 in number of employees, man-hours worked and total payroll, according to Mr. C. O. Skinner, Executive Secretary of the Automotive Parts and Equipment Manufacturers Association.

The average number of employees in the industry for the first four months of 1935 was 175,633 as against 156,902 for the first four months of 1934. The total payroll for the first four months of 1935 amounted to more than $71,000,000 and the man-hours worked showed an increase of 18.4 per cent over the first four months of 1934.

N. Y. Railways Would Replace Cars with Buses

Substitution of buses for the network of street cars operated by the New York (City) Railways Corp. is proposed in the petition for reorganization under the bankruptcy laws filed with the court this week. The cost of the change is put at $13,000,000 and the necessary cash has been promised by the Fifth Avenue Coach Co. which controls the Railways company.

Of the total expenditure $7,500,000 would be provided by obligations on the bus equipment which would replace street cars in Manhattan on Lexington Avenue, Columbus-Lenox Avenues, Broadway, Seventh Avenue-Delancey Street, Sixth Avenue, Eighth Street, Fourteenth Street, Twenty-Third Street, Eighty-Sixth Street and 116th Sreet. Bus franchises also have been requested for Eighth Avenue-Central Park and Ninth Avenue routes.

Fostoria, York Merge Fender Operations

Effective August 1, the Fostoria and York lines of replacement fenders were merged into one line under the Fostoria brand name.

According to C. D. Pifer, Fostoria Pressed Steel president, all sales and distribution activities will be handled from Fostoria under the direction of C. W. McDaniel, general sales manager.

Warehouse stock consolidations are contemplated. The factory in York will serve Eastern territory, and the factory at Fostoria, with supplementary warehouses will serve Western and Southern wholesalers.

NAM Denounces Walsh US Contract Measure

The Walsh Government contract bill was denounced this week by the National Association of Manufacturers as "nothing more nor less than an Administration-sponsored effort to do by indirection what the Supreme Court said in the poultry case could not be done directly under the Constitution." The measure is now before the Senate.

"Under this measure every bidder on Government contracts," the NAM declared, "every sub-contractor, every supplier of material, every borrower of funds from any of the numerous Government lending agencies and many other classes of citizens would be subjected to absolute control of a Federal bureaucracy as to wages, hours and other working conditions.

"The practical implications of this effort to revive Federal control are such that in establishing wage and hour regulations, manufacturers in some sections of the country would be penalized even more than others because of the impossibility of providing wage and hour differentials such as existed under the outlawed codes.

"If enacted, the adverse effect of such legislation would be to definitely increase the cost of construction and supplies to the Government and to private builders and consumers. It would seriously impair efforts of public and private lending agencies to stimulate new construction and modernization, and to provide reemployment in the building trades and industries of the country. It would start the Government upon another impossible policing job and place a premium upon the irresponsibility of those who might seek to evade the law. It would make for additional costs not only to the Government, but upon industry, to be absorbed by the consumer through higher prices."

Johns-Manville Markets Tru-Check Brake Tester

A new low-priced brake tester has been placed on the market by Johns-Manville Corp. of New York. The device incorporates a cleated belt running over three pulleys whose shafts are equally spaced and carried on a frame which can be moved over the floor on rollers. In making use of the tester, the wheel whose brake is to be tested for holding power is jacked up, the tester is pushed up against it with the belt contacting the tire tread, and the belt is then turned by means of a crank handle at the top of the tester. On this crank handle there is a gage which indicates the turning moment which must be applied to the crank handle in order to turn the wheel against the holding power of the brake. The tester sells at $75.

Vandenberg Denounces Tax Bill for Its Effect on Ford Industries

Senator Vandenberg of Michigan told the Senate today that the administration tax bill would drive the Ford Motor Co. into "diversified ownership which can come only through enormous ultimate stock sales to the public." The Senator declared that the company "will be forced out of the close control which has preferred the creation of a vast and effective instrumentality of employment to dividends."

Picturing the Ford Company's broad economic significance as an employer of 100,000 persons in Wayne County, Mich., and employer of countless others as purchaser of supplies from many industries, Senator Vandenberg said the bill would rob the company of its integration; "bluntly, it will be driven into the hands of Wall Street, or its equivalent, and the money changers, who have striven vainly in years past to achieve this end," said the Senator, "and whom this Administration says it proposes to drive from the temple, will have been handed the dominion which in no other manner could be obtained.

"How could it be otherwise? Consider the known mathematics. Assume that Mr. Henry Ford owns a majority of the Ford Motor Co. stock. Assume that the Ford Motor Co. is worth half a billion dollars. Assume that Mr. Ford's total estate will be $300,000,000. The proposed inheritance tax, on top of the existing estate tax, would take $270,000,000 of this $300,000,000. Most of the $300,000,000 is represented by factories which house essential industry and by equipment which provides jobs for thousands upon thousands of employees. Where do you get the $270,000,000? You cannot take the factories. Without motivating genius behind them, they are futile brick and mortar. You cannot sell off the machinery—unless you sell off the livelihood of the greatest single group of high paid workmen in the world. You cannot take Government title to the stock and submit the institution to political management and control. That would be the final absurdity."

Car Makers Tapering Off

(Continued from page 157)

in employment conditions over comparable period last year which was October 31 when plants were changing over to new models and the index dropped to 50.2.

Plymouth

More than a quarter million new Plymouth cars were sold at retail during the first 30 weeks this year, deliveries to July 27 totaling 250,083 cars or 29.2 per cent more than in similar period last year and exceeding the volume for all of 1933. So far this year, Plymouth dealers have delivered an average of 8336 cars a week against a weekly average of 6451 in the corresponding 1934 period. Weekly sales have exceeded the 10,000 mark four times this year and for 10 weeks were over 9000.

Aggregate Plymouth deliveries in the domestic market last week were 8256 cars comparing with 8664 in preceding week. Plymouth weekly sales have held above the 8000 mark since March.

Ford

July retail deliveries in the domestic market totaled 99,694 cars and trucks, only 1188 units less than the June total of 100,882, according to a company announcement. Ford retail deliveries in the first seven months totaled 734,655 units, an average of 104,950 per month. Only in January, February and July did deliveries fall below the 100,000 mark.

Buick

Domestic retail sales of 6024 Buick cars in July substantially exceeded the tentative schedule set up at the first of the month and compared with deliveries of 7033 cars in June. Final 10 days of the month accounted for 2425 deliveries as compared with 1969 in the preceding 10 days and 2385 in corresponding period last year. General Sales Manager W. F. Hufstader said that Buick dealers entered August in the best condition with respect to new car stocks they have enjoyed for that period in a number of years and that used car sales also have been maintained at a high rate with the result that these stocks also have been reduced to a satisfactory minimum.

Chrysler

Chrysler Division dealers last week delivered 3210 Plymouths and 924 Chryslers, a total of 4134 cars comparing with 3421 Plymouths and 909 Chryslers, or a total of 4330 units during week ended July 27. For the 31 weeks to August 3 this year Chrysler dealers reported delivery of 99,715 Plymouths which means that the 100,000 mark already has been passed. In the same period Chrysler deliveries were 26,307, almost 1000 in excess of the number reported for the entire year 1934. Comparative figures for corresponding period last year, 76,448 Plymouths and 15,660 Chryslers, gains this year being 30.4 per cent and 80.8 per cent respectively.

Chrysler reports that used car sales by Chrysler dealers continue at a satisfactory rate, with stocks on hand as of Aug. 3 sufficient for slightly over 4½ weeks at current rate of deliveries.

Pontiac

Contrary to the general trend, July production of Pontiac Motor Co. exceeded that of June, output of 17,245 cars comparing with 17,067 in the preceding month. By July 31, production of 1935 models had totaled 124,923 units which compares with 68,848 of the 1934 models by corresponding date last year, and with a total of 76,553 for the 1934 model year. Pontiac factories have been running steadily at a high rate of production for almost eight months, with two shifts working continuously since February, the first time since 1929 that such condition has existed, according to President H. J. Klingler.

July deliveries of Pontiac cars totaled 13,290 as compared with 7952 in July last year and brought the seven months' deliveries for 1935 to 95,695 units against 51,653 in corresponding 1934 period. In all of last year Pontiac dealers delivered 72,877 cars.

Dodge

Sales by Dodge dealers staged a further rise during week ended August 3 when Dodge passenger car deliveries increased to 4103 from 4085 the week before and truck deliveries advanced to 1188 from 1048. Plymouth sales by Dodge dealers, however, dropped slightly to 2525 from 2612. Aggregate deliveries for the week were 7816 as against 7745 for preceding week. A total of 8802 used vehicles were sold during the same week, 134 more than in the week before. Deliveries by Dodge dealers in the 31 weeks to August 3 this year, total 230,506 of which 120,266 were Dodge passenger cars, 33,100 trucks and 177,140 Plymouths. This compares with a total of 152,742 units in like 1934 period, comprising 61,700 Dodge passenger cars, 27,381 trucks and 63,661 Plymouths.

Nash

Shipments of Nash and LaFayette cars during the first seven months of this year were greater than total shipments last year. To date Nash has shipped 28,815 units, while in 1934 total shipments were 28,665. Sales at present, aided by the introduction of the new Nash "400" and 1935 LaFayette, are distinctly on the uptrend according to reports to the factory from distributors and dealers.

DeSoto

DeSoto dealers during week ended Aug. 3 delivered 2521 Plymouths and 556 DeSotos, a total of 3077 cars which was a gain of 18.7 per cent over the corresponding week last year. Plymouth sales were up 9.5 per cent while DeSotos gain was 91.7 per cent.

Hudson

With retail deliveries of 1661 cars during week ended Aug. 3 Hudson and Terraplane retail sales scored the third successive weekly gain. July deliveries totaled 7079, an increase of 17.7 per cent over the 6012 cars delivered in July, 1934.

Studebaker

The Studebaker Export Corporation registered the largest July volume since 1928. Export business last month was 31 per cent better than in July, 1934. Both cars and trucks participated in the increase.

Older Workers Favored

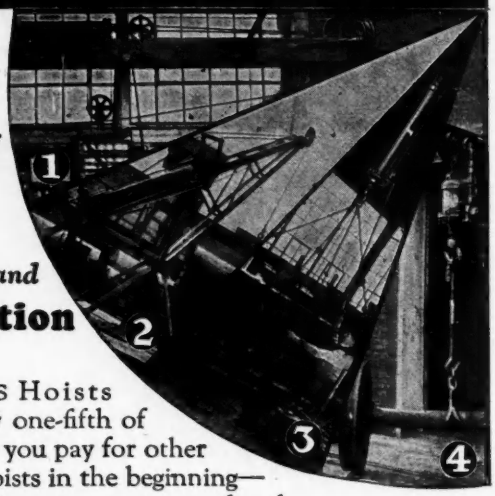
(Continued from page 157)

3—One company whose total employment was reduced by more than 40 per cent showed that the number of men 40 and over declined only 30 per cent.

4—A study of individual records of more than 75,000 men employed in 14 automobile plants during the 1933-1934 season showed that older employees were given far more continuous employment than those under 30 years of age.

5—The records for the same 75,000 men employed in 14 automobile plants during this period showed that annual earnings increased steadily by age groups with the maximum being attained between the ages of 55 and 60. Average annual earnings of the man of 50, 55 or older in this industry were more than 60 per cent higher than the average for employees under 30.

SAVE WITH CURTIS HOISTS



Save Money on First Cost and Operation

CURTIS Hoists cost only one-fifth of the price you pay for other power hoists in the beginning—and continue to save every day they are in operation.

They are simple to operate, fast-moving, spot to a hair's breadth, handle without jerk or jar, require practically no repair—and dust, acids, fumes, moisture or exposure have little or no effect upon them.

Curtis Hoists are available in capacities from one-half ton to ten tons. Investigate these simpler, more economical hoists. Save the difference.

Illustrating
1. Air Powered Crane
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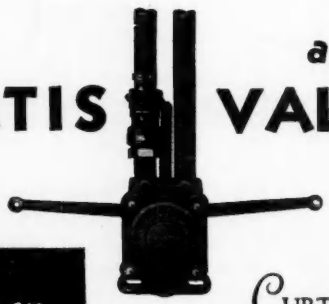

ACCURACY OF CONTROL

•

LOW MAINTENANCE COST

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*Write for surveys definitely proving long life and low maintenance.

•

CURTIS Air Valves remain air-tight after millions of operations because they are rotating disc type—have no stuffing box or packing gland to leak or require repacking.* Valve disc automatically grinds self to seat under operation—prevents wear, leakage, air loss or creeping. Available in 2-way, 3-way and 4-way types for wide and varied uses.

•

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CURTIS COMPRESSORS — AIR HOISTS — I-BEAM CRANES and TROLLEYS

AUTOMOTIVE ABSTRACTS

(*Continued from page 182*)

Rieseler, a former engineer of the Hamburg Vulcan Works. It utilized a hydraulic torque converter, so that in addition to relieving the brake bands of the planetary gear of slip and wear when starting and changing gear, the hydraulic transmission also functioned as a gear, so that only two stages of mechanical gearing were used. A clutch was provided to cut out the slip of the hydraulic drive when required. These developments led to the Daimler Co. in England making a test of the possibilities of combining a fluid flywheel with a Wilson planetary transmission so as to realize these advantages. The combination was an immediate success.—*The Automobile Engineer* for July.

Fuel Taxes Worry French Engineers

A SYMPOSIUM on the subject of motor fuels, particularly with reference to those at present available on the French market, was held by the French Society of Automobile Engineers on March 12. Four papers were presented, three of them by members of the Chamber of Petroleum Refiners. Pierre Minard, manager of the Normandie Refinery of the French Refining Company, dealt with New Crude Oils from Mesopotamia; M. Launay, technical-service engineer of the French-American Standard Refinery spoke on "Anti-Detonants and the Use of Tetra-Ethyl Lead." Louis Pineau, director of the National Liquid Fuels Office, spoke on "Fuel Taxation and General Fuel regulations;" Leon Kaplan, associate director of the Jupiter (Shell) Petroleum Company spoke on "The Fuels Situation," and Pierre Prevost, director of the Laboratories of the Citroen Company, on "Present-Day Fuels From the Car Manufacturers Standpoint."

M. Kaplan complained of the high taxation of fuels in France. He said that gasoline on being landed in France or on leaving the refineries costs 20 to 25 francs per hectoliter (5 to 6 cents per gallon). Taxes and imposts on gasoline, on the other hand, amount to 156 francs per hectoliter (39 cents per U. S. gallon). The Government expects from the automobile and its fuel a certain fixed sum which is provided for in its budget, and it is determined not to renounce it under any circumstances.

The petroleum industry, Mr. Kaplan said, is more than anxious that automobiles should be made more economical (from the fuel consumption standpoint), realizing that more economical transportation would lead to increased use of motor vehicles and thus increase the total consumption. It is, therefore, never the petroleum industry which retards the development of the automobile—quite the contrary. But it is heartbreaking to work for reductions in cost or improvements in quality when one realizes that a simple turn of the tax screw, will wipe out the advantage to the consumer.

M. Kaplan also referred briefly to the legislation by which the importation of refined petroleum products was discouraged and the refining industry was reestablished in France. He said that while the refining of petroleum in France improved the commercial balance of the country, it deprived it of means of bargaining in seeking commercial accords with other countries.

This point was seized upon by M. Pineau in his address, who said that the new legislation which had resulted in the development of the refining industry in France, had resulted in a reduction of nearly 40 per cent in the costs of the petroleum imports of the country. This 40 per cent had paid for French labor. Moreover, France had become an important exporter of petroleum products, having shipped 400,000 tons in 1934.

A complete account of the session devoted to motor fuels is given in the Journal of the French Society of Automobile Engineers (S.I.A.) for March.